Pleasure and pedagogic discourse in school mathematics: a case study of a problem-centred pedagogic modality

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Thesis submitted for PhD examination

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September 2005

Abstract

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This thesis is concerned with the production of an account of the relation between the reproduction of specialised knowledge and the moral discourse within pedagogic practice. The internal mechanism that knots together knowledge and moral discourse is elaborated by way of an analysis of texts produced by the originators of a pedagogic modality they refer to as the "problem-centred approach." The particular texts analysed are: (1) the Grade 1 to 4 textbooks and the corresponding teacher's guides, and (2) video records, supplied by the originators, of what they consider to be exemplary realisations of the pedagogy in practice of the "approach."

The thesis opens with a discussion of a proposition, derived from Bernsteinian studies of curriculum and pedagogy, stating that everyday and academic knowledges are incommensurable, and from which it is claimed that the insistent contemporary attempts at incorporating the everyday into the academic in curricula and pedagogy, under the banner of "relevance," are educationally problematic. Against the Bernsteinian position, a central feature of the "problem-centred approach" is the extensive recruitment of extra-mathematical referents for the purposes of the reproduction of school mathematics. A more general examination of school mathematics texts that recruit the everyday reveal that such texts also associate the everyday with the pleasure of the student, so rendering "relevance," and hence moral discourse, as utilitarian.

The manner in which the moral discourse operates within pedagogy was described in terms of Hegel's theory of judgement and Freudian-Lacanian accounts of imaginary and symbolic identification. Hegel enabled a description of pedagogic discourse at the level of the instructional content, and Freud-Lacan at the level of moral discourse. Hegel also enabled the location of the point at which the moral attaches to the instructional.

What our analysis revealed is as follows: (1) the "problem-centred approach" is a competence-type pedagogy that employs strategies encouraging an initial imaginary identification with the everyday and pleasure, which is used to effect symbolic identification with school mathematics; (2) moral discourse drives pedagogic judgement by means of the imaginary-symbolic dialectic pertaining to identification; (3) evaluation drives pedagogic judgement aimed at the knowledge statements produced by students; and that (4) while the moral discourse is a pervasive and formally necessary component of pedagogy, it is ultimately embedded in the organisation and elaboration of the instructional contents, working in the service of the reproduction of instructional contents, but in accord with dominant ideological imperatives.

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Acknowledgements

I am greatly indebted to my supervisor, Professor Johan Muller, for his contributions to the development of this work, for his friendship and his keen attention to my general professional health. Joe has the knack of asking unsettling questions that are once devastating and astonishingly productive once one has overcome the initial shock. At the end of the day I am deeply appreciative of him for his close interrogation of this work.

I remain indebted to Professor Piet Human, Hanlie Murray and Alwyn Olivier, all mathematics educators at the University of Stellenbosch, for generously making their work available for analysis and discussion in this research project.

The members of the QUANTUM research team—Professor Jill Adler and Caroline Long, both of the University of the Witwatersrand, Di Parker of the University of KwaZulu-Natal, Professor Hugh Glover and Lynn Webb, both of the Nelson Mandela Metropolitan University—have productively engaged with and interrogated aspects of this work. While the QUANTUM project has an object of research fairly different from that engaged with here, my work in QUANTUM proved very productive for my development of ideas pertaining to this thesis. For that, I am immensely grateful to the QUANTUM team.

With regard to the initial development of this work, fellow students, Mignonne Breier, Rob Moore and Jeanne Gamble, along with our supervisor, Professor Johan Muller, engaged enthusiastically with the introduction of formulations and ideas quite foreign to the mainstream of research in education. The bulk of that work has been excluded from this thesis because it takes the project well away from education. I am grateful to all those people for their interest.

The many discussions I had with Jaamiah Galant of the University of Stellenbosch never failed to produce interesting and challenging questions during the early stages of this project and I shall always remain indebted to her for her generous intellectual companionship and friendship.

Heather Jacklin of the University of Cape Town has always responded to my requests for commentary on parts of this work that have appeared as papers with interest and with productive questions. I am grateful to her for doing so.

While they never had little direct involvement with this work, I must recognise the continuing influences of Professor Paula Ensor of the University of Cape Town and Paul Dowling of the Institute of Education at the University of London. They may not know it, but they have been constant intellectual companions in the development of this work.

Abbreviations

ANC	African National Congress
DET	Department of Education and Training
HoR	House of Representatives
HSRC	Human Sciences Research Council
ID	Instructional discourse
MR	Missing representation
NECC	National Education Crisis Committee
NGO	Non-governmental organisation
ORF	Official recontextualising field
PCA	Problem-centred approach
PRF	Pedagogic recontextualising field
RD	Regulative discourse
RMR	Representation of the missing representation

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Chapter 1

The incommensurability thesis and the problem of pleasure

1.1 Introduction

This project is an investigation of a contemporary realisation of the Bernsteinian proposition that pedagogic discourse is an *instructional discourse* embedded in a *regulative discourse* where the latter discourse is dominant (Bernstein, 1996: 46). More specifically, this project focuses on the workings of pedagogic discourse with special reference to pedagogic texts structured by a South African constructivist-inspired mathematics teaching methodology, referred to by its proponents as the "Problem-centred Approach" (PCA).

In Freudian terms, this project is an investigation of a contemporary realisation of the dominant form of the injunction issuing from the superego as it circulates in mathematics education; and, in terms of Jacques Lacan's "return to Freud," it might be conceived of as an investigation of a historically-specific form of the superego injunction: Enjoy! For Lacan the injunction issuing from the superego is *always* aimed at *jouissance* (enjoyment). Today, as will be demonstrated, the superego injunction can be formulated as: "It is your duty to have fun!" or, in more explicitly Kantian terms: "You can (have fun) because you must!" The close semantic proximity of the latter, historically-specific expression of the superego injunction to the Lacanian formulation of the superego injunction in general—Enjoy!—should, however, not induce us to believe that *jouissance* (enjoyment) is congruent with fun. The superego injunction to enjoy could just as well be (and until fairly recently, was) realised as "Obey your father … and other figures of authority!"—an injunction not easily associated with the pleasures of fun. See Santner (1996, 2001) for discussions of the silent weaving of the historical conditions for the collapse of the social efficacy of traditional agencies of symbolic control in the West, the so-called "crisis of investiture." See also, Chapter 2, "Fathers in flight," in Verhaeghe (2000).

As indicated earlier, the empirical object under investigation is a product of the contemporary arena of mathematics education. Mathematics education, as is the case for all fields of social activity aiming at symbolic control, is obliged to transform knowledge into forms of pedagogic communication when its object is the reproduction of mathematics. But, as Bernstein (1996) demonstrates, the principles of the transformation of knowledge into pedagogic communication are never derived from only the internal specificities of the knowledge to be transmitted and acquired. Crucially, the required transformation involves a recontextualisation of elements from diverse, even potentially antagonistic academic, professional, bureaucratic and everyday discourses in order to constitute both general and specific pedagogic discourse, which is the general medium for the transmission and acquisition of knowledge; in this instance, of school mathematics. That is, the resulting bricolage of recontextualised elements that is specific pedagogic discourse (an instructional discourse embedded in a regulative discourse) constitutive of school mathematics inevitably recruits and derives regulative resources from extra-mathematical discourses. A Freudian/Lacanian perspective on Bernstein's regulative discourse leads us to the proposition that regulative discourse is always identified with the historically-specific realisation of the injunction to enjoy issuing from the superego. Bernstein himself, admittedly generally parsimonious in registering his recontextualisings from Freud, paraphrased his own formulation of the proposition on the structuring of pedagogic discourse—an instructional discourse embedded in a regulative discourse—in somewhat Freudian terms as "consciousness embedded in conscience," perhaps thereby recognising the productivity of the superego in the transmission and acquisition of culture. Bernstein derived much of his theory from an engagement with the antecedent work of Emile Durkheim and so, in our recruitment of psychoanalytic theory, we would do well to heed Durkheim's (1982: 129) warning that "every time a social phenomenon is directly explained by a psychological phenomenon, we may rest assured that the explanation is false."

We believe that it is productive to kick off from an event that exhibits an entanglement of the theoretical with the empirical with the latter in its destabilising guise. As concerns the theoretical, the object of an investigation of this nature must be that of interrogation rather than the bolstering and reaffirmation of theory. More specifically, the imperative to develop theory behoves us to focus on the points of its disturbance, namely, on that in the empirical which renders the theoretical mute, or before which theory balks. To that end, let us start to elaborate the specificities of the research problem by way of an encounter with an immediately apparent and disturbing empirical feature of pedagogic discourse within the context of contemporary mathematics education, both local and global: school mathematics pedagogic texts routinely exhibit substantial recruitment of the extra-mathematical, apparently as a resource intended to facilitate the reproduction of school mathematics. This feature of contemporary school mathematics has generated heated controversy, announcing in that way the flaring-up of an antagonistic event that indexes a disruption of the smooth operation of educational theory, especially theory that derives its conceptual coordinates from the work of Basil Bernstein.

1.2 The problem in its immediacy: the everyday is not the academic

A number of recent Bernsteinian educational analyses of various features of South African curriculum design and delivery have produced negative academic evaluations of the move towards the increasing incorporation of the quotidian into the presentations of knowledge within schooling. The sociological work of Paul Dowling and Basil Bernstein have been used as central resources in many of those studies. A brief sampling of such work will be sufficient to illustrate our point that an ongoing critical investigation of the relations between the everyday and the academic as realised in curricula and schooling is underway.

In 1995 in *Perspectives in Education*, Dowling published an important paper, "Discipline and Mathematise: The myth of relevance in education" that marked the incitement to relevance in education as an epistemologically suspect move. Following on that work, Davis (1995)—in "Myth and Mathematics: an analysis of the IEB ABE Level 2 Guide"—and Ensor (1997)—in "School Mathematics, Everyday Life and the NQF: a case of non-equivalence?"—supporting Dowling's position, contributed to the debate with respective focuses on school mathematics texts and the newly constituted South African National Qualifications Framework. Also in 1995, *Social Epistemology* published another important paper, "Schooling and everyday life: knowledges sacred and profane" by Muller & Taylor (reprinted in Muller (2000)), in which they demonstrated the incommensurability of everyday and academic knowledges. Later work by Moore & Muller (1999), published in the *British Journal of the Sociology of Education*, produced a more general critique by, in part, recruiting Bernstein's twin theoretical constructs, *horizontal discourse* and *vertical discourse* (see Bernstein, 1996) to show how an epistemological problem was illegitimately translated into a moral problem in the constitution of what they termed "voice discourses." Morphet's (1997) paper, "Getting Quality into the System", presented at the 1996 conference of the Kenton Education Association in South Africa, also recruited Bernstein's notions of horizontal and vertical discourses to distinguish between principled, propositional knowledge (vertical discourses) and local, strategic knowledges (horizontal discourses) in arguing for the need to reassert a privileged position for the academic in schooling. In 1999 Bernstein's paper "Vertical and Horizontal Discourse: an essay," published in the *British Journal of the Sociology of Education*, elaborated somewhat on Bernstein (1996). In both papers Bernstein argued that everyday knowledges (horizontal discourses) and academic knowledges (vertical discourses) exhibit very different structural features and forms of organisation, warning that "[a]s part of the move to make specialised knowledges more accessible to the young, segments of horizontal discourse are recontextualised and inserted in the contents of school mathematics. However, such recontextualisation does not necessarily lead to more effective acquisition [...] A segmental competence, or segmental literacy, acquired through horizontal discourse, may not be activated in its official recontextualising as part of a vertical discourse, for space, time, disposition and social relevance have all changed" (Bernstein, 1999: 169). Also in 1999, commenting on local changes in official curriculum and pedagogic discourse, Taylor published a paper, "Curriculum 2005: Finding a balance between school and everyday knowledges," as part of the report of the President's Education Initiative research project (Taylor, 1999). Recruiting Bernstein, Taylor argued that attempts at the incorporation of the everyday into the academic in schooling demanded that educators show greater sensitivity to the differences between everyday and academic knowledge if the latter was not to be undermined. More recently, the review of Curriculum 2005 (Department of Education (2000)), also drawing on Bernstein, identified a confusion and a lack of sensitivity to the differences between knowledge types as centrally implicated in the privileging of horizontal coherence at the expense of vertical progression in the South African school curriculum and, in that way, disrupting the integrity of vertical discourse (academic, specialised knowledge).

If there is a single result to be distilled from the body of work cited above, then it is the proposition: the everyday and the academic are incommensurable. One corollary derived from this proposition is that the attempt to generate a hybrid form of knowledge by integrating the everyday and the academic produces a form of anti-knowledge that is of as little value to everyday life, including the world of work, as it is for supporting and enabling academic practices. However, despite the intellectual force of the academic argument, it remains the case that curriculum designers, textbook publishers, educational materials producers, politicians, teachers, students, parents, business people, and even an increasing number of academics working in the arena of education as well as teacher trainers, often adopt antithetical positions to the thesis that the everyday and the academic are incommensurable and proceed with attempts at integration of the everyday and the academic. The attempted integration (of the everyday and the academic) is hailed, variously, as more generally relevant, as practical rather than aridly theoretical, democratic and anti-authoritarian, culturally sensitive and politically appropriate, sometimes even "constructivist" and, insistently, as the basis for educating citizens for participation in a successful modern economy.[1] Of course there are many others who are troubled by the changes in the curriculum, but official pedagogic discourse and its supporters persist in the belief that integrating the everyday and the academic is productive. So, for the Bernsteinians, in the face of what we might call their "incommensurability thesis," it is as though they are witness to the occurrence of an instance of mass fetishistic disavowal in contemporary pedagogic discourses: "I know full well that the everyday and the academic are incommensurable, nevertheless I believe that they are not."

One class of responses to the mass disavowal of the incommensurability thesis has argued that what actually happens is that, even though the everyday is incorporated into curricula and teaching, it is a sham: either a host of strategies enabling teachers (and authors of curriculum materials) to prioritise the academic at the expense of the everyday can be detected at work in pedagogic texts, or teaching and learning fail. Davis (1996) argues along such lines in attempting to demonstrate that while the "traditional" pedagogue effectively vanishes in a particular South African species of constructivism that does recruit the everyday, the pedagogic function nevertheless continues to exist and operate in the interests of reproducing academic knowledge. Similarly, Dowling (1998) demonstrates that even though *School Mathematics Project 11-16* secondary school mathematics texts used in Britain recruit the everyday, textual strategies that background the everyday and prioritise mathematics are at work in those texts designed for so-called high-ability students (but not in the case of texts for low-ability students). Both Davis and Dowling argue that where the everyday is

[1] See the 1994 draft policy proposals for education produced by the African National Congress, as well as the South African state's 1995 White Paper of Education.

incorporated into school mathematics *and mathematics is nevertheless reproduced*, strategies subverting the everyday are at work. Why then bother with incorporating the everyday into school mathematics curricula? We will not rehearse the details of Dowling's complex answer here, but merely note that it is clear that for him the incorporation of the everyday into the academic is one strategy by means of which the differential distribution of knowledge along social class lines is reproduced in schooling in the United Kingdom. We agree with Dowling's conclusion and acknowledge its socio-political importance for evaluating curricula that support the incorporation of the everyday into the academic in the belief that such a strategy enables greater access to erudite knowledge for the general populace.

While it is tempting to judge contemporary curriculum changes simply as attempts at subverting specialised academic knowledge, perhaps current curriculum changes might be interrogated more productively by understanding those changes as very specific responses to a general problem that haunts all attempts at educating, a problem that is a kind of "trans-historical" constant. We can get an idea of the general problem of education by attending to Sigmund Freud's description of it:

> *Education* can be described without much ado as an incitement to the conquest of the pleasure principle, and to its replacement by the reality principle; it seeks, that is, to lend its help to the developmental process which affects the ego. (Freud, 1911/1995: 304; italics in the original.)

Freud (ibid.) situates pleasure as a necessary, yet problematic, element of mental functioning. It is specifically the intransigence of individual forms of pleasure of the human subject that education always has to confront, and especially with respect to its potentially subversive effects. Freud's researches reveal that the persistence of certain individual forms of pleasure has the potential to be self-destructive and even anarchic. At this point we wish to draw attention to the idea that pedagogic discourse is always faced with the problem of negotiating the student's pleasure and the manner in which that pleasure is negotiated is always historically-specific. From this perspective changes in curriculum and pedagogy, in part, index changes in the manner in which pleasure is (to be) negotiated. So, speaking from a Freudian position, the question of pleasure is also a question about the moral order and the confrontation of pedagogic discourse with pleasure is a confrontation of the moral law with pleasure. At this point the term *pleasure* does not accurately capture the constellation of ideas required to establish the confrontation referred to above because adequate terms do not exist in education discourse and, consequently, the introduction of more suitable terms is dependent on the development of the argument made here.

Before we go any further it is worth pausing to recall that we started by discussing the relation between the everyday and the academic as registered in academic debates and we are now discussing pedagogic discourse and pleasure. We effected a shift from the everyday-academic debate to pedagogic discourse and pleasure by inserting Freud's description of education into the discussion. The utility of appealing to Freud resides in his very general characterisation of a central problem confronting education which, stripped of historical content, allows us to point to that characterisation at various historically-specific instances of education. The problem for us at this point is twofold: first, is Freud's general description of the central problem of education reasonable? Second, is it permissible to recast the terms of the debate on the relationship between the everyday and the academic in Freud's terms?

With regard to the first question posed, it is outside the scope of this work to survey a broad range of education systems to test the reasonableness of Freud's characterisation of education, but that is perhaps not a serious problem because we are in this instance really concerned with the validity of the characterisation with respect to structure rather than claiming validity on the basis of noticing a certain stability in the empirical. In any event, phenomena that are noticed because of their repetitive empirical insistence remain merely common experiences until they can be theorised. However, if Freud's position has universal validity then it must be applicable to the current South African situation and we should be able to see evidence of such.

The answer to the second question follows from a positive answer to the first. If education can indeed be characterised as Freud suggests then curriculum and pedagogy, including pedagogic technologies, must be structured in line with that characterisation, from which it would follow that the insertion of the everyday into the academic is a historically-specific strategy intended to facilitate "an incitement to the conquest of the pleasure principle, and to its replacement by the reality principle," (ibid.) rather than a strange, irrational event.

Now, although contemporary official pedagogic discourse lauds the utility of knowledge in its clarion call to what is termed "relevance," the material supports for the realisation for that position (curriculum texts and pedagogic practices) appear to be deeply concerned with the pleasure of the pedagogic subject, as will be demonstrated later. In other words, the general call to "relevance" appears to be translated into a call to "fun" at the level of schooling.

1.3 The problem upon reflection: mathematics should be fun

Consider the hand-drawn picture shown in Plate 1.1. What is it an illustration of? In what context can one expect to come across such an illustration? The picture shows a group of five children accompanied by a rather large, clothed mouse, tearing along the tracks of a roller-coaster, apparently accelerating downward. The characters' facial expressions indicate an experience of benign pleasure rather than the ambiguous quasi-terror—which would usually be indexed by contorted grimaces and screaming—that accompanies such activity. It is as though the characters already enjoy the pleasure of the relief they will experience only after having survived the harrowing experience of a roller-coaster ride. The presence of the mouse suggests that we are peering in on a fantastical world, perhaps that of fiction for children, like an animated cartoon or a comic book in which animals, children and imaginary creatures interact without the interference of adults, in a world where mundane, everyday reality is suspended.

Plate 1.1: Fun on the roller-coaster

If we are now told that the illustration is to be found on the cover of a primary school *textbook* (not a story book), which field of knowledge (represented in the curriculum by either a subject or a so-called "learning area" should we associate it with? ("Learning areas" have replaced school subjects in the South African school curriculum. The eight learning areas are: (1) Languages, (2) Mathematics, (3) Natural Sciences, (4) Social Sciences, (5) Arts and Culture, (6) Life Orientation, (7) Economic and Management Sciences, and (8) Technology.) Perhaps the textbook is for the teaching of a new learning area named "life orientation"? After all, the illustration is about having fun—and life should be fun; or so popular sentiment avers. Or is the textbook about technology, given that the roller-coaster is a machine? Maybe it is for teaching numeracy and mathematics, or even science, since we might need both mathematics and science to construct machines? Could it not be about the economy, since we have to pay for our pleasures? Or even, the social sciences, or arts and culture, or language? The point is that it is impossible to unambiguously associate the picture with any of the eight learning areas prescribed in the South African school curriculum. At the end of the day, the most stable denotation is one of children having fun.

Now consider the illustration shown in Plate 1.2, which is also to be found on the cover of a primary school textbook. Here we encounter a family—Mum, Dad and three children—travelling in what appears to be an all-terrain vehicle, doing a bit of sight-seeing. Perhaps they are holidaying in a game park or are out in the country. Dad is driving while Mum and one of the boys take in the sights; the other two siblings appear to be examining a map. They could be tracing the route travelled by the family. The vehicle and the family's luggage are composed of numbers and arithmetic symbols, while the surface on which the vehicle travels is made of polygons. Again, as in Plate 1.1, we have the suggestion of a fantastical world, only now, rather than an anthropomorphised mouse, the signifier of such a world is the use made of mathematical objects to construct a literally mathematised world.

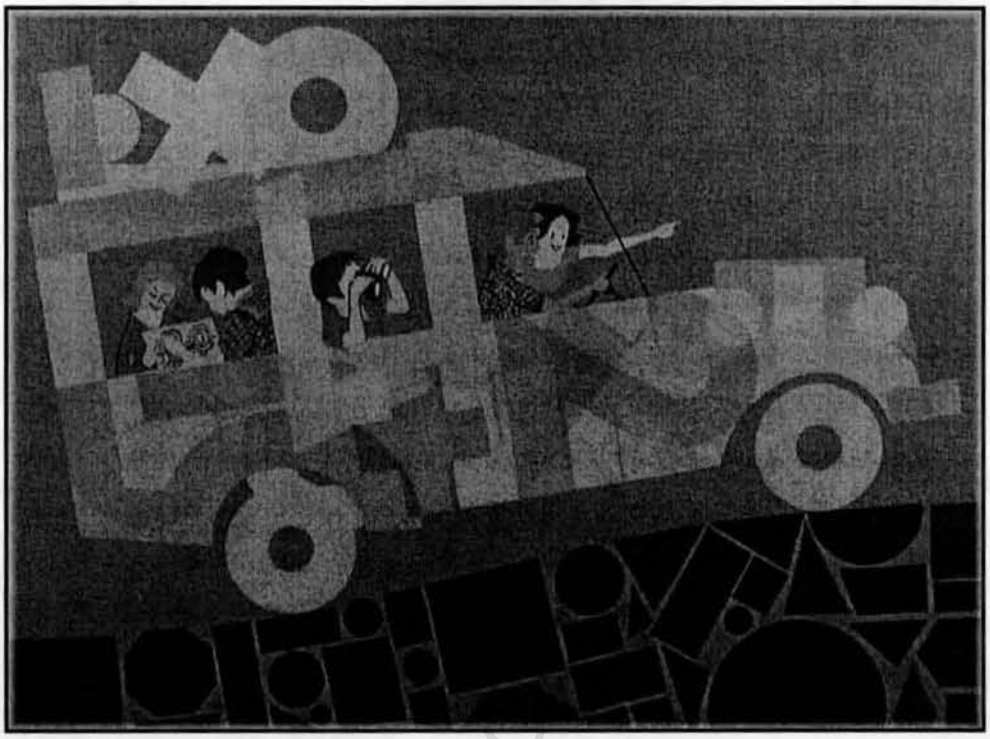


Plate 1.2: Fun on a mathematised holiday

As with the illustration shown in Plate 1.1, we once again see children involved in a recreational activity, engaged in a bit of family fun. However, unlike the case of Plate 1.1, we *can* associate Plate 1.2 with a school subject. Clearly the depicted activity is not in itself an instance of mathematics, but the vehicle and the surface on which it travels unambiguously signify primary school mathematics: elementary arithmetic and geometry (or, "number" and "shape" as commonly referred to in the context of South African elementary schooling). The title of the textbook from which Plate 1.2 has been extracted is *Let's Discover Mathematics 1*, and that from which Plate 1.1 has been extracted is *Mathematics at work, Grade 1*.

What Plates 1.1 and 1.2 have in common is the suggestion of a coincidence of fun and fantastical worlds. Outside of the title, the cover of *Mathematics at work* (Plate 1.1) makes no reference to mathematics. The cover of *Let's Discover Mathematics* (Plate 1.2) constructs a metaphor in which mathematics is both the vehicle and ground for the discovery of mathematics. These two textbook covers are different from that shown in Plate 1.3, in which fun is discursively referenced in the title, *Mathematics Can Be Fun*, and where the depicted activities are rather mundane and everyday: shopping and shop-keeping. Here the message appears to be that the acquisition of school mathematics can be fun if mathematics is embedded within the quotidian.

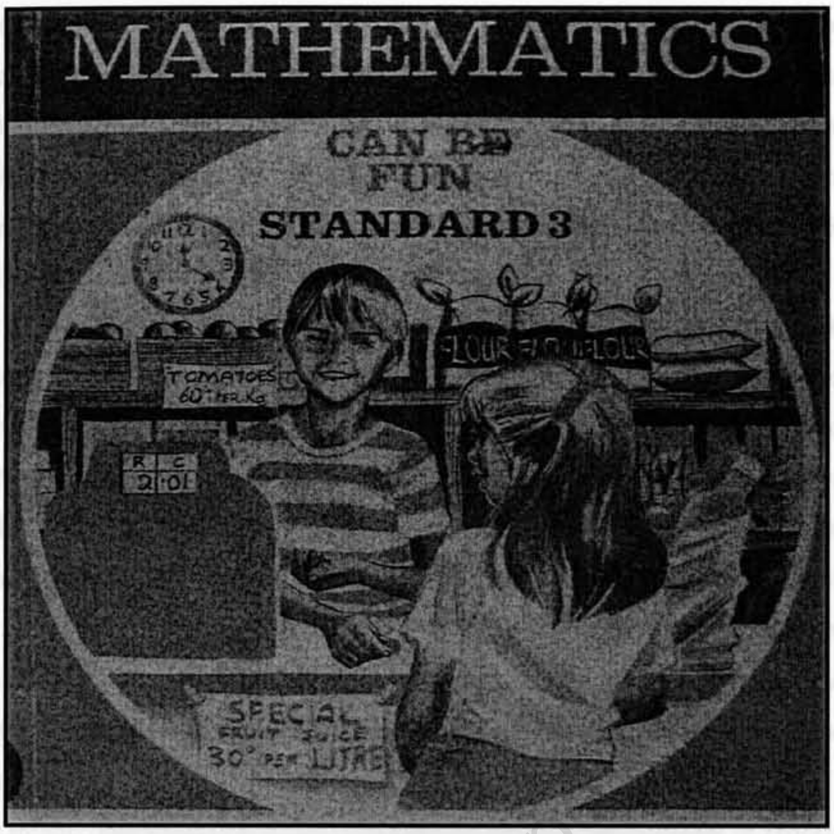


Plate 1.3: Fun in shopping and shop keeping

The illustration, showing a moment of interaction between a girl and boy in Plate 1.3, unlike the illustrations in Plates 1.1 and 1.2, is not an unambiguous representation of children having fun. Both shopping and assisting in a shop may well be pleasurable for some children but those activities also strongly signify the parental imposition of chores on children. The two children shown in the illustration are clearly of school going age, and therefore the moment of their interaction must be taking place outside of school time—during school holidays or over a weekend or, perhaps, after school, but note the time on the clock (12:20). While it is reasonable to expect that children be given chores during time away from school, it is unusual not to associate that time, especially in reference to children, with recreation. Unlike the first two illustrations considered above, Plate 1.3 shows an instance of mathematics made "useful" in an apparently realistic way. Notice the clear display of numbers and numerical relations put to use in the illustration. A range of primary school mathematics topics are signified in the illustration: *money*, of course; *capacity* (orange juice in litres); *mass* (tomatoes in kilograms); *proportional relations* and/or *multiplication* (cost per unit quantity of the juice and tomatoes); *addition* (total cost displayed by the cash register and in a form redolent of so-called "column" calculations—the girl appears to have purchased more than one item, hence the need for addition); *subtraction* (it would appear that the boy is handing over change to the girl); and *time* (the presence of the clock).

So it appears that the three textbook cover illustrations (Plates 1.1 to 1.3) all reference fun in some or other way, implying a connection between pleasure and the acquisition of school mathematics. The examples discussed here are instances of a general trend in school mathematics and not anomalies—below we show that the connection between mathematics and pleasure in the presentation of school mathematics texts is pervasive.

1.4 The problem in its necessity: pleasure is problematic

Let us return to Plate 1.1, which is representative of depictions encountered on the covers of more recent school mathematics textbooks, especially those published for use with Curriculum 2005—Plates 1.2 and 1.3 are extracts from covers of books published earlier, in 1971 and 1993, respectively. An interesting feature of Plate 1.1 is, as was emphasised earlier, the lack of any clear reference to mathematics in the cover illustration. Plate 1.4 shows the full front cover of *Mathematics at work, Grade 1* from which the image in Plate 1.1 was extracted. Usually one expects a correspondence between title and depiction, but when no clear correspondence exists, what then is the relation between title and depiction?

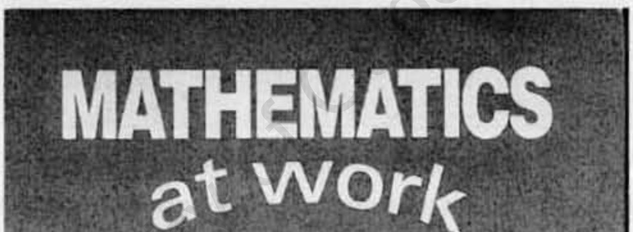


Plate 1.4: Front cover of *Mathematics at work, Grade 1*

In Plate 1.4, the title functions as *a representation of that which is not represented in the picture*, which is mathematics. In different terms, the title functions as the *representation of a missing representation* (mathematics), somewhat like a Freudian *Vorstellingsrepräsentanz* (Freud, 2001; also, cf. Žižek, 1989). For Freud, a *Vorstellingsrepräsentanz* is a representation substituted for a representation that has been repressed, where the exclusion of the repressed representation functions as a positive condition for the emergence of what is represented.

While Freud elaborated the idea of a *Vorstellingsrepräsentanz* in the context of his theory of unconscious repressions, it nevertheless remains productive to produce a Freudian reading of the front cover of *Mathematics at work, Grade 1*, and it is tempting to conclude on that basis that in order for fun to emerge, mathematics must have been repressed. However, we are not dealing with a clear case of Freudian repression with respect to school mathematics in this instance because mathematics *is*, after all, announced in the title. What we do have is an exclusion of mathematics from the depiction and the relation between depiction and title is one of subject (in the sense of *content*) to object: fun is the subject (content) of the depiction but the title represents its object. The cover asserts that the pleasure of the student is its subject while mathematics is its object. It should further be noted that fun is announced through the *image* while mathematics is announced linguistically, that is, *discursively*, and also that the image of fun, with which the student is expected to identify, is fantastical—recall the presence of the mouse. The title is not functioning in the way we would commonly expect it to; that is, as an instance of metalanguage commenting on what is depicted from a distance. It is the absence of a signification of mathematics from the depiction that produces a situation in which there is no external distance between title and image because the title cannot function as metalanguage. The cover as a whole might be thought of as functioning as an object language, staging a view of the contemporary pedagogic relation: the pleasure of the student, which is aligned with fantasy and the image, circulates around its object (mathematics) which is what is lacking in the image, but which is aligned with the discursive.

The teacher, like mathematics, is lacking in the image, but perhaps like the operator of the roller coaster, s/he is intended to facilitate the production of fun from an unseen, central vantage point. The crucial difference between the roller coaster operator and the teacher is that the latter is required to facilitate the reproduction of mathematics as well as the production of fun.

Now consider the two series of Plates (1.5 to 1.8 and 1.9 to 1.12) of covers shown below. The first series is one of covers of *Mathematics at work* textbooks published before Curriculum 2005 was introduced; the second shows covers of the same textbook series repackaged for Curriculum 2005. Both series show depictions of fantastical fun—note the presence of the anthropomorphised mouse once again. The most obvious difference between the depictions used in the two series is that the signifiers of mathematics present in the first are absent from the second and in their stead we have children at play. That said, Plate 1.12 does show children pouring coloured blocks over a mouse but the dominant signification remains that of children having fun. The association with mathematics in

Plate 1.12 is very weak because: (1) blocks of the type shown in the depiction are commonplace children's toys; (2) the activity engaged in by the children is merely a bit of mischievous fun.

Plates 1.5 to 1.8 where we have an anthropomorphised mouse engaged in a "developmental" sequence of activities involving objects to which mathematical signifiers have been attached. Plates 1.5 and 1.6, respectively, show geometric and arithmetic descriptions of the world experienced by the fun-loving mouse. In other words, the mathematics neophyte first encounters the world as mathematised space (Plate 1.5) and then, apparently more abstractly, as number (Plate 1.6). In Plate 1.7 we see the mouse juggling balls that have fractions written on them: the more experienced student should now be able to "juggle fractions"; that is, able to calculate with fractions. Plate 1.8 shows the mouse performing a tightrope balancing act in which it uses a dumbbell marked with numbers to maintain its balance: by exploiting the commonplace pedagogic metaphor, "an equation is a balance," the depiction suggests that the student should be able to understand and manipulate arithmetic equations; that is, they should begin to understand mathematical identity, which is essential to their appreciation of algebra and, more generally, of mathematical argumentation.

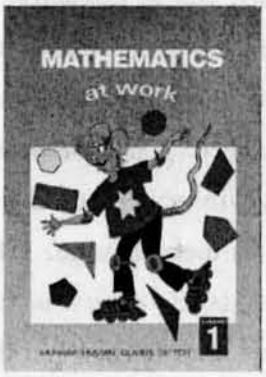


Plate 1.5

Plate 1.6

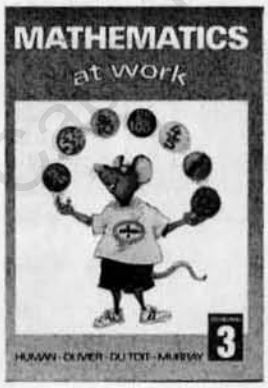


Plate 1.7

Plate 1.8

Plate 1.9

Plate 1.10

Plate 1.11

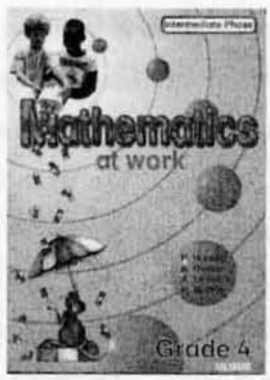


Plate 1.12

We can therefore argue that the images of the first series depict fun as already mathematised, while the images of the second show fun as the inherent condition of the student. The titles of texts in the first series still function as metalanguage, commenting on the depicted activity from a distance. It would seem that the covers of the first series produce a statement which is very similar to that of a series referred to earlier, *Mathematics Can Be Fun*: mathematics is fun if the activity of the student and the world are mathematised. In other words, the central pedagogic problem suggested by the first series is that the student's pleasure is not mathematised, but can apparently be solved by directly attaching signifiers of mathematics to the pleasure of the student.

What the second series the covers produce, as argued above, is an object language asserting that what the field of mathematics and the pedagogue immediately encounter in efforts at reproducing mathematics *is* the pleasure of the student. The pedagogic problem suggested in this second case is that of the student's pleasure, and not so much whether or not that pleasure is mathematised. The implied solution, in terms of our earlier Freudian analysis of the relation between title and depiction in the second series, is that the pleasure of the student must be made to circulate around mathematics, the object absent from the depictions. The difference between this solution and that suggested by the first series is that the second series defines the problem with greater clarity: whether or not the student's pleasure is mathematised is of secondary importance; of primary importance is that the pursuit of mathematics become libidinally invested for the student—which is just another way of saying that the pleasure of the student should circulate around mathematics, which is not to say that mathematising the student's pleasure is a pedagogic strategy not employed within the second series. Of course the danger of the second solution is the possibility of the production of a pleasured student with little regard for the reproduction of mathematics.

1.5 The unbearable insistence of pleasure

In this Section we wish to draw attention to the ubiquity of pleasure, announced as fun, in contemporary school mathematics texts. At this point our purpose is simply to show that pedagogic discourse appears to be saturated with references to pleasure. Later we will deal with the significance of such saturation, specifically detailing the workings of the pedagogic logic that appeals to pleasure so insistently.

Dowling has produced a persuasive analysis and description detailing the relations between the covers of the *SMP 11-16* series of secondary school mathematics textbooks and school mathematics as an activity, arguing that

> [t]he cover illustration of a book is an important scene setter which, if read with reference to the activity in which it participates, must minimally constitute an affiliation of its authorial voice and an identification of its reader voice (Dowling, 1998: 242).

In his project Dowling's analysis of textbook covers was concerned with an examination of the relation between social class and the distribution of "esoteric" and "mundane" knowledge and practices. That concern is not out of place here, but we are, at this point, more directly concerned with the relation between pleasure and the (re)production of school mathematics—a concern not explicitly dealt with by Dowling, although his work can conceivably be extended to incorporate an account of pleasure.

The range of school mathematics texts discussed earlier, from which cover illustrations were extracted, apparently announce an association between the pursuit of school mathematics and the experience of having fun, as though the study mathematics *is* fun. That such an association might be more apparent than real is reflected in the title of one of the texts, *Mathematics can be fun*, where the almost imploring "can be" of the title barely succeeds in masking the presence of a more directly moralising *ought*: mathematics ought to be fun!

To make the point more forcefully, let us consider a different mathematics textbook, published in July 1999, in which the injunction, "Enjoy!", features explicitly: the grade 7 textbook, *Maths for all* (see Johnson *et al.*, 1999) produced by the Schools Development Unit at the University of Cape Town. The cover shows four smiling children, of a more or less politically correct gender and racial spread, dressed in casual clothes and in the process of constructing cardboard models of what appear to be classrooms: a school building constructed of prefabricated classrooms of the type we commonly find in ex-DET and ex-HoR[2] schools is shown in the background (see Plate 1.13).

The introductory material to the textbook is divided into two sections: "To the learner" and "To the teacher." The subheadings of each of the sections are printed in violet. What is interesting about the section "To the learner" is that the final sentence of the section, while not a subheading, conforms to the format of subheadings: it is separated from the antecedent text by a blank line and is printed in violet. It reads, "Enjoy *Maths for all*!" This is a curious bit of text, for it is neither a heading nor an element of the discussion. (We should bear in mind here that the quoted injunction is part of the introductory material that prefaces the actual tasks through which mathematics is to be transmitted and acquired, and like a preface, it confronts the reader at the beginning as a commentary on the composition of contents of which it is not part.) This odd linguistic form—Enjoy *Maths for all*!—which lies in limbo between heading and commentary is precisely the form of an injunction: it is both the condensation, in a signifier, of what is to follow it as form *and* an exhortation, a demand to obey. We contend that this form of injunction has become pervasive in pedagogic discourse and is increasingly announced linguistically and pictorially, at least, in the introductory material of pedagogic texts (like textbooks and other curriculum material). We provide support for this assertion and

[2] Racially segregated education under apartheid was administered by race-specific departments of education. The House of Representatives (HoR) administered the education of coloureds (people of "mixed" racial decent) while the Department of Education and Training (DET) administered the education of black Africans.

present, through a brief review of textbooks, evidence of the increasing reference to pleasure in mathematics education.

The sample of textbooks examined is constituted as an opportunity sample consisting of the holdings of the Carlton Harrison Education Library, the Teaching and Learning Resources Centre and the Mathematics Education Project, all at the University of Cape Town; in all, 50 primary and 42 secondary school mathematics textbooks, representing 55 textbook series, 20 publishers and spanning the years 1960 to 1999, were consulted. Since textbook series often use common introductory material (prefaces, forewords, etc.) for the each of the numbers in a series, not all the textbooks in every series were consulted. First a simple tally of explicit references to pleasure in the *introductory material* and on *covers* of textbooks was produced and is exhibited as percentages in Table 1.1 and Table 1.2, respectively. Table 1.3, which shows a composite of Tables 1.1 and 1.2, was produced by counting a book only once if both cover and introductory material referenced pleasure. The textbooks were grouped in bands corresponding to decades by their publication dates and the percentage of books referencing pleasure for each decade was produced.

The empirical indicator of a reference to pleasure is simply taken to be a statement that asserts that learning, or doing, mathematics is, can be, or will be pleasurable, as indexed in the use of terms such as "fun," "enjoy," "exciting," "pleasure" and "entertaining," all carrying significations of pleasure. Three examples of such statements are shown here:

Dit is ons oortuiging dat Rekenkunde met meer sukses en genot bestudeer kan word as wat so dikwels in die verlede die geval was. Ons vertrou dat hierdie boekie 'n middel sal wees vir onderwyseresse en vir leerlinge om hierdie doel te verwesenlik.

[*We are convinced that arithmetic can be studied with greater success and enjoyment than was often the case in the past. We trust that this little book will serve as a resource enabling both teachers and students to attain that goal.*]

(Hauptfleisch, 1970: "Voorwoord"; page not numbered. Italics, our translation.)

The main idea in the design of this book is to give you the fun of discovering mathematical laws yourself. [...] We hope that you will enjoy using this book and that you will find mathematics the really exciting subject that it is. (Fitton, de Jager & Blake, 1983: "How to use this book"; page not numbered.)

The content and spirit of this book are in harmony with the latest developments in mathematics curricula. The name of this book is a true reflection of its emphasis—mathematics can be and is fun. [...] Mathematics will be fun working through this book. (Engelbrecht, *et al.*, 1993: "Preface"; page not numbered.)

The empirical indicator of a reference to pleasure with respect to the covers of textbooks is a depiction suggesting play or recreation of some sort, often showing smiling children, but not necessarily unambiguously signifying mathematics. Of course, given that the textbooks are about mathematics, the assumption must be that the activity depicted in some way connects with mathematics. Plates 1.13 to 1.16 show examples of such elementary school mathematics textbook covers.

Plate 1.13: *Maths for all, Grade 7*

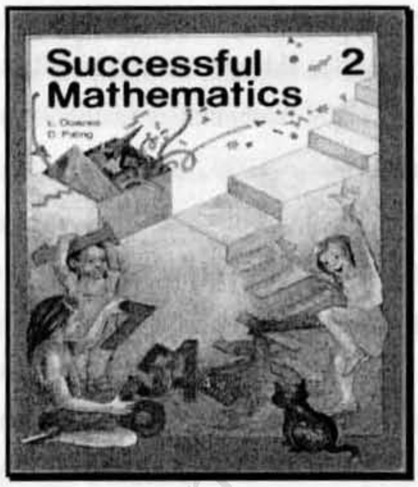


Plate 1.14: *Successful Mathematics, 2*

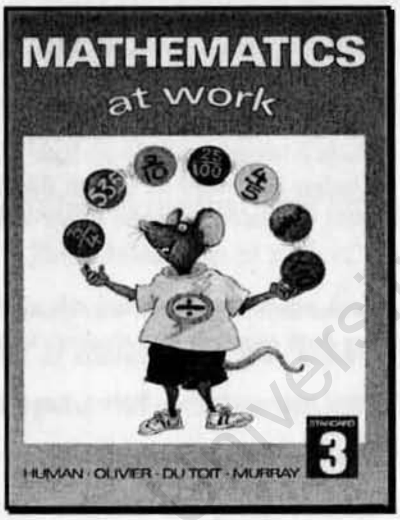


Plate 1.15: *Mathematics at work, Grade 3*

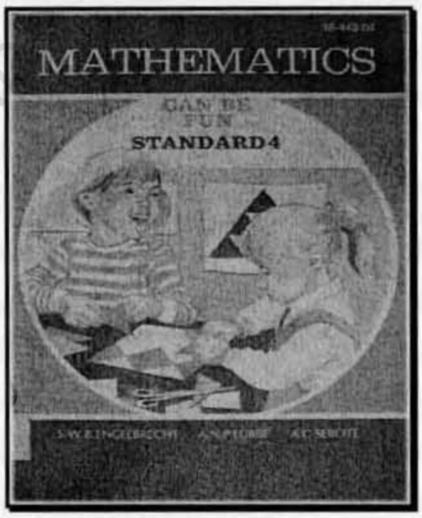


Plate 1.16: *Mathematics can be fun, Standard 4*

Even with this very crude sampling and scant analysis it would appear that there has been a dramatic increase in explicit references to fun over the four decades from 1960 to 2000. Clearly we could do more work on the analysis of the introductory material and covers of textbooks, but that is a different project demanding a study of its own. What has been highlighted here is sufficient for our purposes. The increased reference to pleasure is not confined to mathematics; it is probably safe to conjecture that mathematics textbooks are, so to speak, catching up with textbooks for other subjects.

Decade	% of texts referencing fun	Sample size
1960 -1969	0 %	16
1970 - 1979	5,7 %	35
1980 - 1989	33,3 %	12
1990 - 1999	48,3 %	29

Table 1.1: Introductory material referencing pleasure

Decade	% of texts referencing fun	Sample size
1960 -1969	0 %	16
1970 - 1979	0 %	35
1980 - 1989	16,7 %	12
1990 - 1999	55,2 %	29

Table 1.2: Covers referencing pleasure

Decade	% of texts referencing fun	Sample size
1960 -1969	0 %	16
1970 - 1979	5,7 %	35
1980 - 1989	41,7 %	12
1990 - 1999	82,8 %	29

Table 1.3: Composite – introductory material and covers

That a more explicit reference to pleasure is becoming, or has become, a commonplace feature in the business of publishing curricular materials is also suggested by the manner in which some publishers present their school textbook wings as purveyors of pleasure. In this regard consider, for example, the images associated with *Macmillan in Africa* (Plate 1.17) and *Macmillan Caribbean* (Plate 1.18).

Plate 1.17: Macmillan in Africa

Plate 1.18: Macmillan Caribbean

1.6 The insistence of pleasure in the *Mathematics at work* textbook series

Let us now move from the general to the specific and briefly focus on texts from the textbook series that will be discussed in detail in this work, the *Mathematics at work* series prepared for use with Curriculum 2005. The remarks we make at this point necessarily adumbrate our later discussion of the series. How we analysed the tasks and units will not be discussed at this point because that is dealt with in Chapter 5. A detailed, exhaustive examination of the texts for Grade 1 to Grade 4 mathematics, taking as the primary unit of analysis what the authors refer to as tasks (for Grades 1 to 3) and units (for Grade 4), reveals that a huge proportion of those tasks and units, 77.6% of them overall, reference pleasure in one or other manner (see Table 1.4).

Mathematics at work 1 (n = 80)	*Mathematics at work 2* (n = 101)	*Mathematics at work 3* (n = 160)	*Mathematics at work 1* to *3* total (n = 341)	*Mathematics at work 4* (n = 114)	*Mathematics at work 1* to *4* total (n = 455)
54 67.5%	67 66.3%	120 75%	241 70.7%	112 98.2%	353 77.6%

Table 1.4: Proportion of tasks/units referencing pleasure in *Mathematics at work* (Grades 1 to 4)

In the tables shown here we have marked out the Grade 4 text as separated from the those for Grades 1 to 3 for two main reasons. First, the Grades 1 to 3 texts do not organise the contents in sections or chapters as was common practice in the past. Turning to the pages of contents, the reader is confronted with lists of task titles from which it is difficult to assess what the mathematical content might be. In addition, with respect to the everyday references apparent in the lists, the referents reflect the contingent nature of encounters with objects and beings populating a child's environment. The Grade 4 text, on the other hand, is organised as a collection of modules each of which are composed of a number of units. The organising device of a module is a "phase organiser," so that there is an attempt at producing some extra-mathematical coherence in the organisation of the contents. With respect to mathematics we find that an attempt is made to focus on specific contents across the units of module so that a degree of mathematical coherence is also established.

Second, as will be seen in subsequent Chapters, the dominant modality of referencing pleasure in the Grade 4 text differs substantially from the modalities operative in the Grades 1 to 3 texts, so that the pleasure of the latter texts is qualitatively different from that of the Grade 4 text. Briefly, the key feature distinguishing the dominant modality of referencing pleasure in the Grade 4 text is the use of a textual device that locates pleasure firmly in the student's attempts to learn mathematics rather than in anything extra-mathematical, as is the case in the texts for the earlier grades. Interestingly, at the bottom of the first page of text after the list of contents in *Mathematics at work, Grade 4* we find the injunction "Work hard and enjoy it!" printed in italics and in a larger point size than the rest of the text on the page.

Mathematics at work 1 (*n* = 80)	*Mathematics at work 2* (*n* = 101)	*Mathematics at work 3* (*n* = 160)	*Mathematics at work 1* to *3* total (*n* = 341)	*Mathematics at work 4* (*n* = 114)	*Mathematics at work 1* to *4* total (*n* = 455)
24	34	94	152	56	208
30%	33.7%	58.8%	44.6%	49.1%	45.7%

Table 1.5: Proportion of Tasks/Units referencing work in *Mathematics at work* (Grades 1 to 4)

The texts in the *Mathematics at work* series also reference some or other labouring activity (work) much of the time, with 45.7% of the tasks and units overall made to do so (see Table 1.5). Of course, a number of the tasks and units reference both work and pleasure (see Table 1.6).

Mathematics at work 1 (*n* = 80)	*Mathematics at work 2* (*n* = 101)	*Mathematics at work 3* (*n* = 160)	*Mathematics at work 1* to *3* total (*n* = 341)	*Mathematics at work 4* (*n* = 114)	*Mathematics at work 1* to *4* total (*n* = 455)
11	18	71	100	55	155
13.8%	17.8%	44.4%	29.3%	48.2%	34.1%

Table 1.6: Proportion of Tasks/Units referencing work and fun in *Mathematics at work* (Grades 1 to 4)

From Tables 1.4 to 1.6 we see that, in the case of the *Mathematics at work* series, texts for the first four years of schooling make a substantial number of references to pleasure and work (see especially Tables 1.4 and 1.5) and the references to pleasure exceed the references to work for each of the texts.

If we conceive of the appeal to pleasure in school mathematics texts as an exhortation to enjoy in a specific way, and we also recognise that school texts are produced with specific curricula and pedagogies in mind, then it follows that both curriculum and pedagogy must, respectively, exhibit prescriptions and technologies in support of the specific exhortation to enjoy. Now we know that the curriculum of concern here, Curriculum 2005, has made much of the need for texts, teaching and knowledge to be so-called "relevant" and useful. The question is, then: concerning curriculum and pedagogy, how do relevance and utility stand in relation to pleasure? To answer this question we draw on the work of utilitarian philosopher, Jeremy Bentham, but we also need to present a brief historical sketch of pedagogic responses to the student's pleasure from apartheid education to the present. It is those tasks to which we turn in Chapter 2.

1.7 The way forward

While it is a relatively simple matter to point out the association of pleasure with mathematics announced by the texts referred to here, it remains a great deal more difficult to move beyond the obvious and describe the supposed productivity of the use of the idea of pleasure—in pedagogic discourse and pedagogic texts—in a theoretically principled manner. One of the propositions that will be explored in this work is that pleasure is not a spontaneous subjective event, or state, but instead issues from, in this context, a moral imperative central to pedagogy.[3] Why this should be so, and what its effects are on pedagogic practices and the structuring of pedagogic texts will be of concern when exploring our proposition. However, in order to explore the proposition systematically a suitable theoretical language will have to derived through an engagement with a selection of theoretical antecedents and an empirical object (strictly speaking, a particular class of empirical objects). The principal theoretical antecedents recruited here are: the sociological work of Basil Bernstein, especially his theory of the pedagogic device, and also that of neo-Bernsteinian Paul Dowling on the sociological reading of pedagogic texts; the psychoanalytic theories of Sigmund Freud and Jacques Lacan, especially the latter's theories of discourse; the philosophical work of Georg Hegel, especially his theories of judgement and the syllogism; and selections from what might loosely be referred to as literary theory and associated fields of scholarship, like the work of Algirdas Greimas in narrative semiotics. It must be stressed that the overriding theoretical concern here is to develop the potential of Bernstein's sociology to deal theoretically with the place of pleasure in pedagogic discourse. However, to the extent that Bernsteinian sociology is devoid of adequate concepts and terms to deal with pleasure theoretically, the work of Freud and Lacan are recruited. Since pleasure is of such central concern, it may at times appear that this thesis is more substantially concerned with Lacanian psychoanalysis than the sociology of education—this seems to be an unavoidable situation arising from the lack of appropriate resources within education theory—but the goal of the detour through psychoanalysis is, ultimately, to return to Bernsteinian sociology of education.

The empirical object analytically engaged with is, broadly speaking, the pedagogic text. For reasons that will become apparent later, the central point of focus when considering a pedagogic text will be the *evaluative event*. The empirical objects are produced from texts deriving from a constructivist-inspired teaching methodology referred to as the *problem-centred approach* by its originators (principally mathematics educators working at the University of Stellenbosch in the Western Cape Province of South Africa). The particular texts analysed and discussed here are (i) the Grade 1 to 4 textbooks and teachers' guides of a scheme, *Mathematics at work*, for the teaching and learning of primary school mathematics; (ii) videotexts of raw footage of exemplary problem-centred teaching; and (iii) videotexts of interviews with a teacher and her students made available for this research project by the problem-centred approach originators. The video footage (of (ii) and (iii)) was

[3] The term pleasure is rather imprecise and is inappropriate for technical use but will be used for now. In subsequent Chapters pleasure will be replaced with more suitable terms.

used to produce segments (weekly episodes) on problem-centred teaching for an educational series, *Awethu*, broadcast on South African public television during the 1990s.

1.8 A schematic guide to the thesis

The general theoretical frame of this project is, of course, Bernstein's theory of the pedagogic device: the hierarchically-related set of rules—distributive, recontextualising and evaluative—structuring the transformation of knowledge into pedagogic communication. The theory of the pedagogic device serves, then, as the chief structuring resource for the elaboration of our analysis and discussion. To that end, we start in Chapter 2 with a consideration of the content of the distributive rule, showing that the distribution of social goods today, of which knowledge is an element, is subject to contemporary utilitarianism, in which the pleasure of the modern, abstract citizen is used as the central resource for moral regulation. In arriving at the specification of the content of the distributive rule, marking out the morality of the distribution of social goods, we have thereby shifted onto the terrain of the recontextualising rule.

The content of the recontextualising rule, which is discussed in Chapter 3, is concerned with the constitution of pedagogic discourse, and it is here that we locate the point at which the problematic of pleasure is occulted in Bernsteinian theory. Pedagogic discourse is defined by Bernstein as an instructional discourse (knowledge and skills and their inter-relations) embedded in a regulative discourse (moral discourse) where the regulative discourse is dominant. Since Chapter 2 demonstrates that the problematic of pleasure is inextricably bound to moral discourse in general, the absence of adequate Bernsteinian theoretical resources enabling us to grasp the functioning of pleasure in pedagogic discourse is found to be located at the level of the regulative discourse. The question of the *functioning* of pleasure in pedagogic discourse already indicates that we are moving to a consideration of pedagogic practice proper, and with that we arrive on the terrain of the evaluative rule.

Chapter 4 explicates Hegel's theory of judgement which is later used as the central resource for constructing the analytic procedures. The discussion of Hegel takes the form of a close analysis of a section of one of the texts from the series that is discussed in this work. The resources recruited from Hegel, in relation to the evaluative rule are, however, insufficient to deal with significant features of the functioning of pleasure in curriculum texts and pedagogic practice. In order to more adequately grasp those features we turn to the psychoanalytic theories of Sigmund Freud and Jacques Lacan for the necessary theoretical resources, specifically to describe different modes of identification.

Chapter 5 entails the construction of analytic procedures for revealing the content of the evaluative rule because it is in terms of the structuring effects of the evaluative rule that the analysis of the empirical texts is produced. Since the rules of the pedagogic device are dialectically entailed, with the one emerging from the limits of its antecedent, the whole of the device is condensed in the evaluative rule. In other words, the contents of both the distributive and recontextualising rules come to be condensed in the evaluative rule, producing in that way what Bernstein (1996: 52) refers to as a "symbolic regulator of consciousness."

Chapters 6, 7 and 8 are dedicated to close analyses of the series of textbooks and of the videotexts. In Chapter 6 we analyse the series of texts in detail to reveal the workings of the modes of identification in operation. Chapter 7 focuses on the use of pleasure in empirical instances of teaching and learning as captured on video. Chapter 8 discusses the workings of pedagogic judgement in the transmission and acquisition of contents and the distribution of a specific set of subject-positions. Chapter 9 concludes the thesis with a reassessment of the structuring of pedagogic discourse.

1.9 A general note on reading and methodological conventions

This work draws on and discusses aspects of the work of Bernstein, Freud and Lacan, theorists who display a great sensitivity to structure—social structure in Bernstein's case, psychic structure in the case of Freud and Lacan, although the latter also addresses social structure at the level of inter-subjective relations. Structures are treated here, as they are in Bernstein, Freud and Lacan, in a manner distinguishing structure from specific historically-situated contents. The latter are treated as organised by the structure. In this work structures are appealed to in order to read and explain the empirical. The reader will not find descriptions of the empirical like, for example, "the instructional collapses into the regulative" or "the closing of the discursive gap" in this work because such statements indicate structural transformations and need to be argued for through an analysis of the logic of the particular structure itself at two levels: (a) the conformity of structure to its object and (b) the conformity of structure to itself, that is, its internal consistency. The points at which structure fails to grasp the empirical adequately are read as points at which theory requires elaboration.

While we develop the argument through a sustained engagement with a very specific pedagogic modality, referred to by its originators as the "problem-centred approach," the latter is always approached from the viewpoint of general theoretical propositions (principally from the works of Bernstein, Freud, Lacan and Hegel) so that our discussion simultaneously reveals the specific features of the problem-centred approach (the empirical) in the terms of the general *and* works at the level of the theoretical in order to enable the general to grasp the particular.

Chapters 3 and 9 are the only chapters that do not directly engage the empirical. Chapter 3 is devoted to a detailed examination of Bernstein's notion of pedagogic discourse and an account of elements of Freudian and Lacanian theory that pertain to identification.

Chapter 2

The distributive rule and contemporary utilitarianism

2.1 Introduction

The central purpose of this Chapter is map out the general features of the contemporary content of the distributive rule of the pedagogic device. We will proceed by initially attending to the content of the distributive rule at the macro level; that is, as defined at the level of the political.

Consider the following statement by the African National Congress:

> We believe that the curriculum must promote unity and the common citizenship and destiny of all South Africans irrespective of race, class, gender and ethnic background. It must be relevant to the needs of the individual as well as the social and economic needs of society. The curriculum must promote independent and self-critical learning and respect the equality of all forms of knowledge. And more importantly, the process of curriculum development must be democratised through the participation of all stakeholders. (African National Congress, 1994: 68)

Here we encounter the assertion of a principle of power that has effected profound transformations at the level of state education policy and its education agencies in the mid to late 1990s, curriculum design and structure, prescriptions for pedagogic practice, the organisation of schooling and actual teaching and learning at the level of the classroom. The statement by the ruling political party announces a radical reconfiguration of the distribution of educational opportunity in South African state-supported education. The position on education of the ANC was incorporated into the legal reconfiguration of education by the South African state. Ensor (2004: 217) describes the unfolding transformation of education as follows: "From the middle of the 1990s, the South African government set about implementing wide-ranging policies intended to bring about the upgrading and transformation of education and training. A system blighted by the deep-seated inequality, indifference and malaise of the apartheid years has begun to change, albeit unevenly. Curricula have been reworked, and policies have been put in place to build schools, improve management systems, overhaul assessment mechanisms and so on, all to give effect to mass schooling for the first time in the country's history." In the 1995 education White Paper we see how the new principle of power was transformed into a principle of integration that was to inform the construction of a new curriculum:

> Education and training are each essential elements of human resource development. Rather than viewing them as parallel activities, the Ministry of Education believes that they are in fact closely related. In order to maximise the benefits of this relationship, the Ministry is committed to an integrated approach to education and training, and sees this as a vital underlying concept for a national human resource development strategy.
>
> An integrated approach implies a view of learning which rejects a rigid division between "academic" and "applied", "theory" and "practice", "knowledge" and "skills", "head" and "hand". Such divisions have

characterised the organisation of curricula and the distribution of educational opportunity in many countries of the world, including South Africa. They have grown out of, and helped to reproduce, very old occupational and social class distinctions. In South Africa such distinctions in curriculum and career choice have also been closely associated in the past with the ethnic structure of economic opportunity and power. (Republic of South Africa, 1995: paragraphs 2.3 - 2.4)

At the level of the curriculum for school mathematics, the power principle effects a transformation of mathematics from a (disciplinary) subject into a "learning area" that observes the curriculum principle of integration. In support of this transformation, teaching and learning resources come to be redesigned to reflect the new principle.

At the level of classroom, pedagogic practices are also transformed substantially to support the new principle: cooperative learning, new forms of assessment, changes in the way teachers and students relate to each other and changes in the organisation of the classroom are introduced.

We can argue, *grosso modo*, that a change in the principle of power produces changes at three moments of the education system: at the moment of State education policy, the moment of curriculum planning, design and delivery, and the moment of the pedagogic practices of the classroom. Stated differently, the dominant principle concerned with the distribution of power is transformed into policies of the State, including education policy; from the education policy State agencies derive principles for the design of curriculum and the structuring of schooling; finally, from the curriculum principles and prescriptions, principles for actual pedagogic practice are derived. At each of the moments emphasised here decisions have to be made about the *what* and the *how* of practices. While the *what* is the assertion of the power principle and its translation at the various moments, it is insufficient in-itself because it can be realised only through a coordination of appropriate technologies for-itself (*how*). The *how* is therefore about control of the activity of agents and resources at each of the moments for the realisation of the *what*. Stated more crudely, but more concisely, the *what* is about power, the *how* is about control, and both are always simultaneously present in education. It follows from this that, because the power principle cannot be realised merely through its enunciation and so is dependent on the *how* for its realisation, the *how* has within it the potential for changing the *what*; the potential for changing the power principle. That is why the *how* is always subjected to heavy policing by the State: specifications, curriculum and pedagogic prescriptions, forms of organisation, bureaucracy—the very technologising of education—are all about control, about the *how* in the service of the *what*. We can begin to see how a teacher caught in the web of control that is the *how*, is able to contribute to the realisation of the *what* qua effect of power without knowing what it is, and without apparently needing to know.

If the *what* and *how* are fundamental to the structuring of education at every moment of the system, then any examination of education has to take into consideration the effects of the *what* and the *how*; or, which is the same thing, the effects on education of the operation of power and control. Stated differently, every object of *educational research* can be understood as an articulation of the *what* and the *how*, and the crucial problem for research is how a specific articulation of the *what* and the *how* might be grasped. The specific articulation, as we saw in the example of State schooling, can be understood in terms of three moments: (1) the power principle as it pertains to education; (2) prescriptions for the organisation of resources and the delivery of educational transmissions; and (3) the actual practices of transmission and acquisition.

While it was helpful to explore the relation between *what* and the *how* and the effects of that relation across the whole of the education system, we can, if our interest is restricted to any one particular moment, describe that moment in terms of *all three* moments once again. In other words, what we have is a *structure* that is fractal in nature (cf. Moore & Muller, 2002): for any one moment we can ask: (1) what its principle of the distribution of power/knowledge is; (2) what its principle for the technologising of transmission and acquisition, derived from (1), is; and (3) what its the principle for the recognition and realisation of appropriate transmission and acquisition, derived from (2), is. The principle of power in the terms of the theory of the pedagogic device is the content of the distributive rule; the principle for the technologising of transmission and acquisition of knowledge is the content of the recontextualising rule; and the principle for the recognition and realisation of appropriate transmission and acquisition is the content of the evaluative rule.

2.2 The form of the content of the distributive rule of the pedagogic device

In his discussion of the distributive rule Bernstein (1996: 45) points out that the distributive rule creates a "specialised field of production of discourse, with specialised rules of access and specialised power controls." What is being emphasised in the statement is the field of knowledge production, which Bernstein will later contrast with the fields of the recontextualising and the reproduction of knowledge. However, Bernstein (Op.cit.: 42) is also quite clear that the distributive rule specialises "forms of knowledge, forms of consciousness and forms of practice to social groups," which indicates that we should not reduce the work of the distributive rule to solely the generation of the field of the production of academic discourses. The distributive rule, through the distribution of knowledge, consciousness and forms of practice, is ultimately distributing access to social goods and contributing to the (re)production of the social division of labour. In other words, while it is clear that the content of the distributive rule at any moment cannot be understood outside of the operation of power, its effects are not only political but also economic. But we can go even further and argue that the content of the distributive rule—its historically-specific principle(s)—is derived from the political economy. The latter proposition is constituted through a recruitment of Marx's (1974) notion of *commodity fetishism* and Sohn-Rethel's (1978) discussion of the Marxian notion of *real abstraction.*

First, in his analysis of the commodity-form, Marx (1974: 77) arrives at a definition of commodity fetishism as that of an inversion in which "a definite relation between men, that assumes, in their eyes, the fantastic form of a relation between things." In other words, social relations are expressed in the value of a commodity, but in a strange way, in which value becomes detached from social relations and appears to be an intrinsic property of commodities in the form of a particular *monetary value.*

Stated differently, while the value of a commodity is an effect of social relations within the division of labour, value is treated as though it inheres in the commodity outside of its relation to its social base. However, the key to commodity fetishism is to be found in the production of an equivalent which expresses the exchange-value of commodities: two commodities become equivalents only when one is rendered as though it was always-already, in itself, the equivalent of the other, which seems to be a property of it independently of its relation to the other. The most abstract realisation of such relations is, of course, money.

In his discussion of the transition from feudalism to capitalism, Marx (1974: 63), drawing on Hegel's notion of reflex-categories, points to a similar phenomenon at the level of social relations between people: "For instance, one man is king only because other men stand in the relation of subjects to him. They, on the contrary, imagine that they are subjects because he is king." So what we have are two modes of the fetishistic relation: at the levels of the relations between commodities and the relations between people (social relations) but, as Žižek (1989: 25) points out, the relationship between the two fetishistic modes is not that of simple homology because, in the transition from feudalism to capitalism, fetishism at the level of social relations (characterising feudal social relations) gives way to fetishism at the level of the circulation of commodities (characterising capitalist market relations). For Žižek the modern abstract citizen, caught up in social relations dominated by market relations, fully recognises that the place of power is formally empty, and distinguishes between the symbolic place of power and the contingent agent who occupies that place at any given moment. In other words, s/he who holds a symbolic mandate is necessarily distinct from and subject to the Law, unlike the situation under feudal relations where the king (or feudal lord) could not commit a crime because whatever the king did immediately announced and defined the Law. The model for relations between people is no longer that of feudal "domination and servitude" but rather that of market exchange relations, in which each, formally free, subject follows their own egoistic interests (ibid.). Differential access to the social good now comes to be experienced as the contingent effect of the play of market forces rather than as an effect of relations of "domination and servitude." In formal terms Žižek is, in general, correct, but we believe that he oversimplifies the argument. The two fundamental modes of social solidarity recognised by Durkheim—mechanical and organic solidarity—are both still very much in evidence today. Relations of mechanical solidarity, characteristic of pre-capitalist societies in which fetishistic social relations pertain, nevertheless persist in the form of *similar-to* relations today, even as they are over-determined by market relations.

Second, let us turn to Sohn-Rethel's (1978) discussion of real abstraction. Concluding from his detailed series of analyses of commodity exchange relations, Sohn-Rethel finds that two fundamental modes of consciousness result: the "practical" and the "theoretical." However, he argues that the two modes of consciousness are effected by an abstraction that inheres in the act of the exchange of commodities. Here we should be careful to distinguish between the consciousness of the individual subjects engaged in commodity exchange and the act of exchange itself. It is the structure of the latter, according to Sohn-Rethel, that, while it is not thought, has the form of abstract thought. Real abstraction is the form of relations between commodities in the act of commodity exchange; the individuals who relate as exchange agents are, for Sohn-Rethel, acting as "practical solipsists" while the form of their exchanges is that of theoretical consciousness. What he is driving at here is that in the act of exchange, commodities are stripped of their specific use-values, their empirical qualities, and become abstract units of exchange-value, providing in that way the form of abstraction that is necessary for the elaboration of theoretical reason. This means that the form of theoretical reason is already staged at a moment external to such reason. In terms of our specific interests here, we can then argue that the distribution of the social good, ultimately structured as it is by commodity exchange, already presents in the form of real abstraction a prefiguring of the form of consciousness. In addition, when Sohn-Rethel's results are combined with Bernstein's proposition that consciousness is embedded in conscience, we must conclude that conscience itself (the rules of social order/moral discourse) is subject to the structuring effects of the real abstraction inherent to commodity exchange. The content of the distributive rule of the pedagogic device must then be structured by the political as well as the economic.

From the discussion in Section 2.1 it should be clear that, in general terms, with respect to the distribution of knowledge in South African state-sponsored education, the content of the distributive rule is structured in a manner asserting the equality of all forms of knowledge in an attempt to, nominally, flatten social class hierarchies and the consequent differential distribution of knowledge, as well as fixing the distribution of knowledge to the perceived demands of the individual, community, and the economy. For Ensor (2003: 326), the move "signals a determination to erode three knowledge boundaries: between education and training, between academic and everyday knowledge, and between different forms of knowledge, disciplines or subjects. The erosion of these boundaries was expected to result in the collapse of a fourth: the social boundaries between groups on the basis of race and class." The call for "relevance" in education is therefore three pronged: it asserts the necessity for the realisation of individual relevance, social relevance and economic relevance. What Sohn-Rethel's argument suggests is that individual and social relevance are over-determined by economic relevance. What we need now is a general characterisation of the contemporary content of the distributive rule.

2.3 General features of the content of the distributive rule

Here we follow a line of analysis opened up by Muller (2001: 129), in which he draws attention to a general discomfort with boundaries in the fields of knowledge production and reproduction:

> Boundaries are the condition of intelligibility of ourselves and of our world. This Kantian precept snakes its way through much of the social theory of the early twentieth century only to come up short against a trend of social thought that is evident everywhere as the century ends. It sometimes even seems as if the notion of boundary has become the quintessence of totalitarianism. To live a life beyond bounds and without boundaries is the dominant ethical ideal (Jardine, 1999); to enquire into facts and meanings that exceed epistemological boundaries is the primary research ideal (Lather, 1991); to teach children to cross boundaries wherever they may find them is the

pedagogical ideal (Giroux & McLaren, 1994). To treat the world as a continuous network of interlinked intensities and flows beyond all divides and divisions is all there is and all there should be (Deleuze, 1995).

Sohn-Rethel's (1978) analysis of the circulation of commodities suggests that the transformation in our experience of boundaries in the fields of knowledge (re)production is correlative to transformations at the level of commodity exchange. Today, with the imperialist/colonialist stage of capitalism well and truly over, and the spaces for the production of new markets extremely limited, we are encouraged by global capital to turn away from large-scale stable social arrangements which provided us with a limited set of predictable identities, to the idea of each of us cultivating a unique "life-style." Fashioning a "life-style" demands a continuous self-refashioning in the field of shifting identities through the accelerated consumption of "life-style" enhancing products. In other words, the solipsistic self-enhancing dance of capital becomes the model for the "life-style" of the modern subject; and just as capital cannot countenance the imposition of external boundaries that would inhibit its flow, so the subject is persuaded not to countenance the imposition of boundaries. We argue that the *economic requirement* of the dissolution of boundaries to the flow of capital ultimately structures the form of the social division of labour and social relations today, where the maintainers of strong social boundaries are viewed with suspicion. By this we definitely do not mean that there is a return to mechanical solidarity today, even though the irruption of so-called "fundamentalist" social formations may well exhibit many of the features of social relations under conditions of mechanical solidarity: contemporary "fundamentalisms" are a response to capital, and therefore entirely internal to it, rather than the parallel existence of pre-modern social forms.

We obviously cannot provide the necessary, detailed general economic analysis to support our position here, so we have to find an economical way of making a reasonable case. To that end we fix on the image of social relations transmitted by contemporary advertising. Why focus on advertising? To answer this question, we first need a brief discussion of Bernstein's notion of *symbolic control.*

For Bernstein (2001: 23), symbolic control "is the means whereby consciousness, dispositions and desire are shaped and distributed through forms of communication which relay and legitimate a distribution of power and cultural categories." In other words, the reproduction of culture takes place through the processes of symbolic control. Bernstein takes care to distinguish between agents of symbolic control and agents in the economic field (the field of production of commodities as physical resources) because he wishes to reserve symbolic control for discursive production:

> Agents of symbolic control specialise in dominant discursive codes increasingly made available in the higher reaches of the educational system. These discursive codes shape legitimate ways of thinking, ways of relating, ways of feeling, forms of innovation and so specialise and distribute forms of consciousness, disposition and desire. Whereas the dominant agents of the economic field regulate the means, contexts and possibilities of physical resources, the dominant agents of the field of symbolic control regulate the means, contexts and possibilities of discursive resources. Thus in the economic field: production codes; in symbolic control: discursive codes. (Op.cit.: 24)

The division of labour of the field of symbolic control is described by Bernstein (Op.cit.: 25-6) in terms of six categories: repairers (medical, psychiatric, social services), reproducers (teachers in schools), diffusers-recontextualisers-propagators (mass and specialised media), shapers (creators and designers of symbolic forms) and executors (administrative functions). We would expect that the advertising agencies are probably considered as inhabiting the moment of the division of labour of symbolic control described as diffusers-recontextualisers-propagators. However, Bernstein appears to be somewhat undecided: "Clearly the line between some of these functions will be less clear than others and some functions may not fit too comfortably in a particular category, e.g. advertising" (ibid.). We suggest that Bernstein's indecisiveness about the position of advertising is not so much about situating within it one or other of the categories, but rather because it remains perhaps the chief means by which capital directly addresses the desire of the modern subject and thereby attempts to structure inter-subjective relations in the interests of accelerated commodity-exchange. That is, the broader distinction Bernstein is attempting to make, between agents of symbolic control and agents in the economic field, starts to falter when he considers the position of advertising within the field of symbolic control. Advertising, and its base in market research, do not operate independently of the field of economic production and attempt both to open up possibilities for the production of commodities as well as to facilitate the distribution and circulation of commodities.

From Bernstein's description of the moments of the broad division of labour in the field of symbolic control we find that schooling and advertising are to be understood as both inhabiting that field. If such a formulation is to have any validity then there must be a degree of continuity and compatibility between the messages produced at those moments, even though the contents they transmit are obviously specialised to each particular moment. If that is not the case, then schooling and advertising cannot legitimately be gathered together as moments of the division of labour of the same specialised field. Clearly schooling and advertising are moments of the social division of labour in general, but that goes for all specialised activity, and is not the point Bernstein is making. Also, we are not excluding the possibility that agents at any particular moment of the division of labour of the field of symbolic control will periodically challenge the hegemonic messages of the field. In other words, each particular moment of the division of labour of the field of symbolic control enjoys relative autonomy with the respect to the other moments. For example, the moment of the division of labour referred to as "shapers" by Bernstein, which includes academic activity, routinely delivers critical commentary on the messages circulating in the field of symbolic control.

There are four inter-connected messages of interest to our study that we find constantly rehearsed in contemporary advertising: (1) the dissolution of boundaries; (2) the derogation of traditional authority figures; (3) the denial of the close proximity of the other; and (4) policing the absence of fun and pleasure. Any examination of contemporary advertising will of course find a host of other, more familiar, messages in circulation: messages about being a good homemaker, about the advantages of common domestic products (like toothpaste, shampoo, detergent, and so forth), where to get the best buy for this or that product, etc. The messages that we draw attention to are those that indicate a shift in the perception of social relations, specifically those that are presumed to pertain to younger consumers.

2.3.1 The dissolution of boundaries

The message flowing from capital is that, by means of the consumption of a particular product, subjects can liberate themselves and engage in activities that would otherwise be impossible within the constraints of "normal" social activity.

Plate 2.1: Jeep – Go anywhere. Do anything.

For example, the current Jeep television advertisements show people engaged in a variety activities where the presence of physical boundaries are rendered trivial. Consider the particular advertisement showing three friends, each standing on a different mountain peak, in reasonably close proximity, playing a game of Frisbee. They toss the Frisbee across the gorges between the peaks, one to the other, until, inevitably, one of them messes up and the Frisbee falls into a gorge. All three then joyfully rush to their own Jeep shouting to one another: "I'll get it!", "No! I'll get it!" Jeep apparently provides the means for playing a game that would otherwise be impossible.

Plate 2.2: Bill Ford – no boundaries

Plate 2.3: Ford Mustang –no boundaries

Examples of the theme of "no boundaries" in contemporary advertising are pervasive. The Ford motor company even ran a televised competition called *No Boundaries*, broadcast as a series of 13 one-hour episodes in North America, in which contestants used Ford sports utility vehicles. More generally Ford uses the slogan "no boundaries" on posters and promotional materials for its vehicles and puts out a magazine with the title "No Boundaries." Plate 2.8 shows Bill Ford, great-grandson of Henry Ford, addressing a gathering with the Ford logo and slogan in the background.

The "no boundaries" theme is reproduced outside of motor vehicle advertising as well; it is a common, and obvious slogan in travel advertising. For example, the slogan on SASTS posters advertising work-travel packages to local university students is: "I know no boundaries." The slogan is also used in the advertising of clothing: Soviet shoes are advertised with the slogan: "No Boundaries!", and Truworths Man uses the slogan: "Fashion without boundaries."

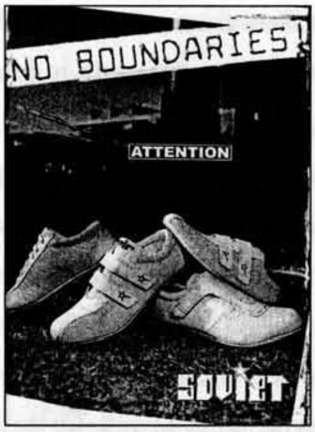


Plate 2.3: Soviet – No boundaries!

Plate 2.4: SASTS – I know no boundaries

The local telephone company, Telkom, advertises internet service provision using the slogan: "Go anywhere. Do anything. Right now."

Plate 2.5: Truworths Man – Fashion without boundaries.

Plate 2.6: Telkom – Go anywhere.

The point we wish to highlight here is that the discursive and, more generally, semiotic support for the circulation of commodities in the field of symbolic control repeatedly frame the notion of externally-imposed boundaries negatively. An immediate consequence of the call for the dissolution of boundaries is that those whose social function is the policing of boundaries also come under fire and have to be positioned as anachronistic social agents whose time has passed.

2.3.2 The derogation of traditional authority

The MTN mobile phone network uses an advertisement in which two teenage children, in a traditional family setting, continually, mockingly laugh at their father: at his taste in music, his clothing, his hairstyle and, finally, his rather large mobile phone. The solution offered to the father in the voiceover is to get one of the latest mobile phones by taking out a contract with MTN.

Another example: a Red Bull energy drink advertisement shows a distressed St Peter who, confronted with a swarm of winged beings, is unable to stop them from entering into heaven. He is contacted by God, on his mobile phone, who fires him. He laments, referring to himself as a two thousand year old doorman who has little prospect of securing a new job. So, Red Bull, which "gives you wings," effects the suspension of the classification of souls into Good and Evil, stripping even the Judeo-Christian God—the ultimate boundary maintainer in Western thought—of His classificatory power and leaving us all safe to pursue our narcissistic everyday interests, provided we consume Red Bull.

A final example: a young black wife and mother prepares a disgusting looking brew that she attempts to feed to her protesting husband and two children in order to relieve their cold and flu symptoms. Her mother/mother-in-law enters asking the young wife what she might be doing. The wife declares that she is using the "traditional cure" as instructed. The mother/mother-in-law, laughing, informs the young wife that the "traditional cure" she was referring to was Wood's Peppermint Cure. The relieved family members eagerly step forward to consume the Wood's medication. Here, even traditional gerontocratic social relations are represented as already in line with and supportive of contemporary forms of commodity exchange. "No boundaries" thus becomes "no boundary maintainers."

2.3.3 The denial of the close proximity of the other

We have all heard the advertising mantra "sex sells" ad nauseam. Yet, careful observation of the use of sex in advertisements suggests that today sex is increasingly used to sell through a suspension of the sexual relationship. Our interest in this category of advertisement derives from its status as the apogee of the narcissistic and onanistic message of global capital, suggesting that for one to achieve true pleasure, even sexually, the pleasure of the other should be suspended. Here the slogan "no boundaries" reveals its ultimate, paradoxical truth: the production of a strong boundary between the subject and the other. For example, a young couple, sexually primed, indulge in foreplay on a deserted beach at night, pushing up against the hard, upright, cylindrical supports of the boardwalk. The women whispers in the man's ear, presumably suggesting that he buy a condom from a nearby vending machine. Alongside the condom dispenser is an Ola vending machine. The man is faced with a dilemma, though only fleetingly: does he spend his last five Rand coin on a condom or does he buy a Magnum ice-cream? Of the two, the phallic ice-cream proves to be the superior prophylactic, and the man walks off, away from the woman, sucking on his Magnum.

Another example: consider the latest series of Lenthéric *Solo* television advertisements depicting a lone woman, atop a bed, and in the throes of ecstasy while the voiceover suggests that the cause of this eruption of intense pleasure is a particular number from the *Solo* range of deodorants for men. Presumably a man has to use the deodorant, but then does not have to concern himself with the hard task of producing a passionate response in a woman—*Solo* will do it for him. The numbers—109, 38.2, 41 and 648—respectively refer to the number of heart beats per minute, body temperature in degrees Celsius, the number of breaths taken, and the number of muscles used by a woman … at the height of passion. Now, rather than view these advertisements as only examples of the transparent ploy of using sex to sell consumable products, they become far more interesting when we attend to what is being exchanged: the product takes over the activity of someone while promising to result in pleasure nonetheless (with *Solo*, the deodorant takes over the seduction from a man; with Magnum, the sexual pleasure offered by a woman). One or other of the partners is rendered passive in some respect while the product acts in his/her stead, still producing a pleasure that should have resulted from their, now suspended, interaction.

In contrast to the Lenthéric advertisements, one of the few advertisements that explicitly does suggest the possibility of a sexual relationship had to be withdrawn by order of the South African Advertising Standards Authority due to public pressure: the Hyundai Getz advertisement that shows a young heterosexual couple about to leave for a night out, when the women turns to the man, saying: "We have to talk." Naturally he observes her apprehensively, waiting to be told that it's all over. She, however, suggests that since they are both adults, why not skip dinner and the movies and just get on with *it*. The public complaint was expressed as a concern about the irresponsible offer of easy sex. However, in the overall context of current advertising, especially given that even racy, highly sexualised advertisements like those for Lenthéric products are tolerated, we can perhaps detect a discomfort in response to the very idea of the sexual relationship. The advertisements that use sex today more often than not use the apparent sexual partner as a vanishing mediator effecting the union of the other partner and a product. Where the product *is* offered as the mediator of an actual sexual relationship, as in one of the Hyundai Getz advertisements, it is sometimes experienced as disturbing.

More generally, the message is that the close proximity of the other is traumatic because it intrudes on our own pleasure. Consider, for example, one of the MTN advertisements announcing the availability of 3G technology on the network: a mother and daughter are represented as apparently directly interacting in the same space through the standard cinematic device of shot-reverse shot sequences, until it is made apparent that they are communicating on video phones, supported by MTN 3G technology, even though they are thousands of kilometres apart. While the immediate message of the advertisement is that we can remain in visual contact with "loved ones" through the use of a new technology, the message trailing in the wake of the first message is that we can in some ways suspend even what are considered to be obligatory forms of contact—between a parent and child—in order to pursue our pleasures; or, what is ultimately the same thing, as we are strategically deployed as "human resources" by global capital. It would seem that the call for the dissolution of externally-imposed boundaries at the level of the circulation of commodities produces the production of strong individual boundaries at the level of social relations. From here it is but a short step to more generally paranoid forms of social relations in which the close proximity of the other is experienced as potentially, if not actually, harmful: if someone smokes near us, they harm us; if they cast us a covetous glance, they harass us; if they are close enough, their body odour offends us ...

2.3.4 Policing the absence of fun and pleasure

Here the objective is to transform activities traditionally associated with the absence of fun into purveyors of fun. For example, a current television advertisement for Fanta soft drinks starts by showing a group of bored children of school-going age sitting around aimlessly. Their stupor is violently disrupted as the wall behind them is explosively smashed through by a group of sumo wrestlers who grab the children, force them into a black panel van and speed away. The abducted children are driven to a deserted farmyard barn where they are set down so that they can view a makeshift stage. The three sumo wrestlers take to the stage where, in tune to a silly ditty made for toddlers, they perform a ridiculous song-and-dance routine, wobbling their masses of flesh grotesquely. The bewilderment of the children dissolves as they burst into responsive laughter which is shared by the sumo wrestlers. The advertisement closes with the image of a mock-up of a ransom note—individual letters of the alphabet cut out from a range of different texts and stuck to a sheet to form a message— which reads: "The fun will find you!" What is interesting about the advertisement is the juxtaposition of practices demanding either extreme discipline, like sumo wrestling, or the policing of the law (see below), with idiotic fun, but in such a way that moments of symbolic investiture are identified with a demand to have fun (through consuming some or other product of global capital, of course).[4]

Another example is the Liquorice Allsorts "fun police" television advertisement that transforms a pejorative expression aimed at strict parents (as those who police their children in order to restrict their fun) by making it signify the contrary: policing individuals for the *absence of fun*, demanding instead that pleasure be embraced. A couple of "cops" armed with bags of Liquorice Allsorts, announcing

[4] Sumo wrestling proper demands a severe degree of discipline right from early childhood (pre-teens) in the form of very specific diet, exercise and religious observance. The intense enjoyment that accompanies such a dedicated, highly ritualised existence is unrecognisable today because it is judged as negating completely the "spontaneous" flow of the subject's search for pleasure. Truth and meaning are, for the sumo wrestler external, residing in the unwavering stability and sacredness of the ritual.

themselves as the "fun police", bouncing on balls, burst in on an adolescent apparently overcome by ennui, attach liquorice sweets to various parts of their bodies, performing ridiculously all the while, until they produce signs of happiness. They "bag" the happily cured adolescent (that is, leave him with a bag of Liquorice Allsorts) and rush off on their bouncing balls with sirens wailing to tackle another case. The examples discussed here are at the same time examples of advertisements that mock the forms of discipline associated with traditional authority.

2.3.5 Concluding comments on advertisements

Advertising agencies are, like schools, agents of symbolic control (Bernstein, 1994) but they produce a much more direct, and hence clearer, translation of the principles for the circulation of capital into principles for the structuring of social relations. From our analysis of the advertisements we suggest that the contemporary production of pleasure might be thought of as a precipitate left over from the intersection of three inter-connected negations: (1) the negation of boundaries; (2) the negation of hierarchical relations (authority figures); and (3) the denial of a close proximity to the pleasure of the other. Individual pleasure is the knot which ties together and normalises the three negations.

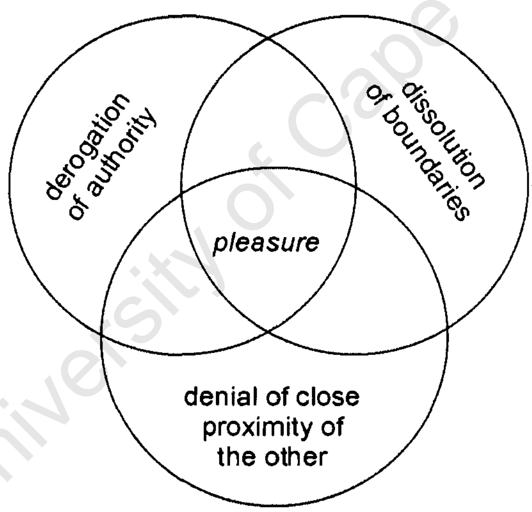


Figure 2.1: Pleasure as precipitate of three inter-connected negations

It is our contention, in line with Marx's proposition on the relation between the circulation of capital and the structuring of social relations, that the state, through the education apparatuses, transforms the economic demands of capital into principles informing the production of education policy, curriculum, pedagogic practice and pedagogic relations. In other words, a major effect of capital on education is the production of a principle for the distribution of social goods, and that principle is translated into the apposite content at every moment of the division of labour within the education system. In advertising the circulation of commodities is translated into an image of social relations, and it is there that we can see confirmation of Marx's proposition. When we move to the education arena we can recognise the correlates to the messages generated within the arena of advertising. The demand for the dissolution of boundaries (to the flow of capital, realised as accelerated commodity exchange) is already at work in economic activity even before education policy makers and curriculum designers take up their pens. From Sohn-Rethel (real abstraction as the form of thought), in conjunction with Bernstein (consciousness embedded in conscience), we conclude that the structuring of the form of the content of the distributive rule is already present in the form of a real abstraction within commodity exchange.

The content of the distributive rule during the period of capital's use of racial segregation to facilitate its self-enhancement in South Africa was such that strong boundaries were clearly asserted and rigorously policed. However, as the demands of capital changed in line with its continued, necessary pursuit of self-enhancement, it became clear that the racial organisation of education (and of symbolic control in general) had to change and, at the level of curriculum, it was the pedagogic constructivists who produced the initial educational resources for the transformation of the content of the distributive rule into a form more compatible with the contemporary demands of capital. It is to that story which we now turn.

2.4. The pedagogic constructivists as vanishing mediators

In this Section we locate the pedagogic constructivist as the mediators between apartheid education and the current state of utilitarian educational reform. First we discuss the move from apartheid education to pedagogic constructivism, and then the subsequent move from the latter to utilitarianism.

2.4.1 From apartheid education to pedagogic constructivism

We noted earlier, in Chapter 1, that pedagogic responses to the vicissitudes of the student's pleasure will always vary historically. One response takes the form of a very authoritarian, police-like system in which any transgression is met with swift, usually public, retribution. Here correction is a spectacle designed to have a prophylactic function by producing shame in the student body. A different response, as realised in the cluster of pedagogies often referred to as "progressive education," is an apparently more gentle and subtle disciplining of the student, usually through techniques of introspection and reflection (made public, of course), that attempt to control students through the production of guilt rather than shame, by exploiting the pleasures of confession. Then we have so-called "constructivism" in education, which we shall refer to as "pedagogic constructivism".[5] Here the individual's pleasure is *a priori* construed as being distinctly disciplinary (mathematical, in this instance) and what is foreclosed is the possibility of the student "constructing" anything that is non-disciplinary through the restriction of the student's representations to what s/he already "understands", meaning that which is already expressed in appropriate terms or is amenable to appropriate disciplinary description. Pedagogic constructivism also links cognitive development to the liberation

[5] We use Dowling's (1998) useful distinction between constructivism as a philosophical doctrine and the ensemble of pedagogic techniques (pedagogic constructivism) derived from that doctrine.

from ego- and sociocentric thinking (see Piaget, 1995)—in Freudian terms, the Piagetian position suggests that positive cognitive development is partly dependent on the student's liberation from irrational individual and group-dominated forms of pleasure.

A different response, but one potentially destructive of whole systems of education, takes the form of a direct focus on the disciplinary effects of power. What pertains in this instance is the control of students through the production of an ethical, often heroic, pleasure—the observation of, for example, the pleasures of revolutionary duty and sacrifice in the face of possible injury, incarceration and death. This response enjoyed widespread realisation in Black schooling in South Africa during the period of student resistance to apartheid, especially during the 1970s and '80s, and was accompanied by a rejection of the, then, apartheid education system. In mathematics education the explicit politicising of school mathematics by the proponents of People's Mathematics locally (e.g., Julie, 1993), and more broadly by the proponents of Criticalmathematics Education (sic) (e.g., Frankenstein, 1989) and some varieties of ethnomathematics (e.g., D'Ambrosio, 1985, 1990; Fasheh, 1991, 1993; Gerdes, 1985, 1986, 1988a, 1988b), were attempts at producing a similar effect while recruiting mathematics as a tool for ideological struggle.

All of the responses to the vicissitudes of the pleasure of the student sketched above have been present in South African education over a relatively short period of time. Apartheid-era mathematics education is today routinely characterised as having being organised as a police-like system in which blind observance of the rules of mathematics was privileged at the expense of so-called "understanding." Such a characterisation is perhaps not entirely accurate but seems to be acceptable to many because it expresses a generally accepted characterisation of the moral law under apartheid.

During the 1970s, '80s and '90s, mathematics education non-governmental organisations (NGOs), sponsored in the main by multinational capital and donor agencies based in foreign liberal democratic states, and many mathematics educators at liberal South African universities encouraged the adoption of pedagogic modalities that were hostile to official mathematics education but compatible with progressivist education. During the same period more politically militant educators, many of whom supported the National Education Crisis Committee (NECC), were drawn to People's Mathematics, Criticalmathematics education and ethnomathematics.

It was during the 1970s that the Human Sciences Research Council (HSRC) sponsored a research project that was to lay the groundwork for the development of a new school mathematics curriculum. The researchers, drawn largely from Afrikaans universities, travelled to Europe and the UK to become more informed about mathematics curricula in liberal Western countries. They produced a series of reports detailing recommendations for changing the school mathematics curriculum (see, for example, Human, 1976; Van den Berg, 1978; Galant, 1997). The subsequent development of a new mathematics curriculum was initially restricted to the Western Province (now the Western Cape Province) and was driven by mathematics educators at the University of Stellenbosch who generated a constructivist-inspired curriculum and a pedagogic modality they referred to as the *problem-centred* *approach.*[6] The central figure involved in that development, Piet Human (who was later given a chair at the University of Stellenbosch), was one of the HSRC-sponsored researchers. The new mathematics curriculum was developed and implemented officially only in the Western Province but nevertheless impacted significantly on mathematics education nationally.

One of the reasons for the popularity of constructivist-inspired pedagogy and thinking about curriculum was its supposed compatibility with democratic practice in education, but with a twist. On the one hand the pedagogic constructivists held that a student's ability to reproduce the standard algorithms of school mathematics was not a reliable indicator of their "understanding" of mathematics and, on the other hand, they argued that what appeared as student errors were really alternative conceptions of mathematics, rational in their own right rather than merely simple misconceptions. In other words, the pedagogic constructivists were apparently questioning those students who had traditionally been most successful (mostly middle-class and white)—"You think you know mathematics, but do you really?"—and they were also apparently comforting and celebrating those students who were traditionally failing (mostly working class and black)—"You think you don't know real mathematics, but you already do!" The latter sentiment was, however, a general message to all students: the "traditional" rehearsal of standard algorithms was really just so much sociocentric dithering (cf. Piaget, 1995) and therefore ideological, irrational and, consequently, disruptive of both the real knowledge already held by all students as well as of their construction of new mathematical knowledge. In that way everyone, white and black, was a victim of apartheid mathematics education.[7]

In order to combat the sociocentric pedagogic tendencies entrenched by apartheid, the pedagogic constructivists argued that school mathematics should be taught and learnt through problems meaningful to students, stated in terms that did not immediately reveal the required mathematical ideas and operations so that the student was obliged to reflect mathematically on the nature of problems in order to "construct" the necessary mathematical contents for themselves. The idea was that if students successfully constructed the mathematical contents themselves then the teacher could be reasonably certain that they had learnt and understood the mathematics. This strategy presented the pedagogic constructivists with a difficulty. How were they to present the student with problems that did not immediately reveal the mathematical resources needed to solve a given problem? Their solution (especially at the level of primary schooling) was to confront the student with problems stated in everyday, non-mathematical terms because, so they reasoned, mathematical forms of expression would give students clues about how to proceed without them needing to think carefully about the meaning of the problem statement. In other words, as a general strategy, they substituted the signifiers of mathematics with the signifiers of everyday life.

[6] In August 1978 the South African Mathematics Project of the Mathematical Association of South Africa (MASA) published a proposal for changes to school mathematics syllabus, informed by the HSRC-sponsored research (see MASA, 1978).

[7] Olivier (1993), a South African pedagogic constructivist and a colleague of Piet Human, explicitly makes such an argument in his paper, "Blaming the victim," presented to the *Second Political Dimensions of Mathematics Education Conference*. Of course, an additional important reason for the popularity of the local pedagogic constructivists was the global shift in mathematics education to constructivism which emerged as the dominant position in the field.

An examination of the content pages of texts prepared for use within such a pedagogy reveals that the well-established practice of using recognisable mathematical topics to organise the presentation of mathematical contents has been dispensed with and replaced by lists of titles of "activities", or "tasks", that refer to the everyday: for example, "Swimming" and "Feeding time" and "Hens" … are three typical titles of mathematics tasks (Murray, Human & Olivier, 2000a). If we examine the contents of the tasks referred to by these everyday signifiers we find they have very little to do with the subjects announced in the titles. Consider the task "Swimming" as an example. Here the student is presented with a picture, showing children frolicking in a swimming pool, which is then followed by the problems: "1. There are 7 girls. How many shoes? / 2. There are 5 boys. How many shoes?" (Op.cit.: 23), which the teacher's guide to the textbook describes as an introduction to "problem structures that form part of the concept of multiplication" and, more specifically, the authors assert that the problems making up the task have "a **repeated addition** structure" (Murray, Human & Olivier, 2000b: 9; bold in the original). The so-called "meaningful context," swimming, is wholly arbitrary and could be replaced by any other "context" amenable to description as an instance of "repeated addition." The important point to note here is that we can, in principle, construct such "meaningful contexts" fairly easily by selecting mathematical content and describing whichever phenomenon, idea or activity is convenient in terms of the selected mathematical content, and then present the student with a problem referring to the phenomenon, idea or activity, requiring them to reconstruct our mathematical description in the form of a solution. However, the phenomenon, idea or activity we select for the construction of such problems need not be non-mathematical to be "meaningful" to the student. For example, much of the work of Gattegno (1963) and Banwell, Saunders & Tahta (1986) in mathematics education, as well as much of the early work of the Association of Teachers of Mathematics in the UK, consisted in producing "meaningful" tasks for school mathematics students without needing to reference the everyday. Today, however, the term "meaningful" appears to be used in a manner that suggests an identification of mathematics with the extra-mathematical life of the student: curriculum, pedagogy and text are required to mirror back to the student their own lives.

That the pedagogic constructivists chose, or felt compelled, to use everyday referents extensively in their construction of "meaningful contexts" was perhaps an index that a restructuring of curriculum and pedagogy around the notion of "relevance" was already underway, a sort of Hegelian silent weaving of the Spirit. By appealing to the everyday, the pedagogic constructivists, while ultimately concerned with reproducing mathematics proper, nevertheless opened up a space into which the utilitarian pedagogic reformers could comfortably step, which is elaborated on in the next Section.

2.4.2 From pedagogic constructivism to contemporary utilitarianism

When utilitarianism is mentioned in mathematics education scant attention is paid to the fact that it is, fundamentally, a moral philosophy that takes as its central problem the means by which the happiness of the populace can be maximised. In the arena of mathematics education utilitarianism generally tends to be treated as through it were mere instrumentalism. Jeremy Bentham links utility directly to pleasure and pain, and the rejection of utility to obscurantist and capricious irrationalism:

> Nature has placed mankind under the governance of two sovereign masters, *pain* and *pleasure*. It is for them alone to point out what we ought to do, as well as to determine what we shall do. On the one hand the standard of right and wrong, on the other the chain of causes and effects, are fastened to their throne. They govern us in all we do, in all we say, in all we think: every effort we can make to throw off our subjection, will serve but to demonstrate and confirm it. In other words man may pretend to abjure their empire: but in reality he will remain subject to it all the while. The *principle of utility* recognises this subjection, and assumes it for the foundation of that system, the object of which is to rear the fabric of felicity by the hands of reason and of law. Systems which attempt to question it, deal in sounds instead of sense, in caprice instead of reason, in darkness instead of light. (Bentham, 1996: 11; italics in the original.)

For Bentham, all human activity—hence all morality—is bound to pain and pleasure, and the principle of utility is defined as a positive principle of happiness:

> By the principle of utility is meant that principle which approves or disapproves of every action whatsoever, according to the tendency which it appears to have to augment or diminish the happiness of the party whose interest is in question: or, what is the same thing in other words, to promote or oppose that happiness. I say of every action whatsoever; and therefore not only of every action of a private individual, but of every measure of government. (Op.cit.: 11-12)

Here the Good is strictly bound to the maximisation of happiness of the populace as a whole. We can therefore no longer identify the Good with a particular content because there is no such content—God, for example—that can serve as the cause of happiness for everyone. It follows from this emptying of the Good of all content by Bentham that we can grasp the Good only as form. In particular, as relations between people and between people and things that cause a maximum of happiness. Here, however, Bentham runs into a problem: how is one to know what it is that maximises happiness for a given individual which, at the same time, does not impinge on the happiness of others? His answer is that things and people should demonstrate reciprocal and collateral utility, *because use is pleasurable*. The more useful a thing or person is, the more happiness is produced. The moral imperative to maximise happiness now becomes a moral imperative to be useful. Still, how do we know what will produce a maximum of happiness other than through experimentation? For Bentham the answer lies in the total transparency of the social body. And how can such transparency be realised? Through a system of complete and uninterrupted surveillance, the model for which is the architectural design he referred to as the *panopticon*.

Before we briefly discuss the panopticon design, we should draw attention to the subtle, yet crucial, change that occurs in the relation between utility and pleasure with the requirement of complete and uninterrupted surveillance. When, in order to achieve the maximisation of utility (and so of happiness) for all individuals, Bentham adds the need for continuous surveillance, we have a shift from the idea that *use is pleasurable* to that of *pleasure is useful*: it is only by registering our pleasures somewhere in a system of social accounting—accepting the necessity for continuous surveillance, in other words—that we can both be accommodated by and serve others. In addition, Bentham is arguing that the ultimate goal of the subject *is* pleasure, so that once we have established that goal and offer its true realisation as a reward, we can gain the cooperation of the subject. The panopticon also has a necessary negative function for Bentham, but one which works in the interests of general happiness: the identification of perverse and anti-social pleasures in the individual for the purpose of swift correction and rehabilitation. The panopticon, which is an architectural design never realised to any great extent in practice, serves as Bentham's organising metaphor for the structuring of the whole of society by a utilitarian gaze (see Figure 2.2).

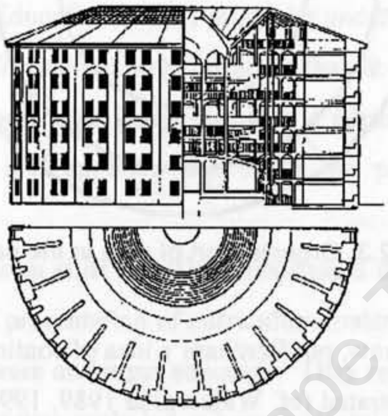


Figure 2.2: Bentham's plan for a panopticon

Bentham's panopticon achieved widespread notoriety in the social sciences and humanities through the work of Michel Foucault on the "birth of the prison" (Foucault, 1977). Simplifying greatly here, the idea is that inmates are organised in individual cells in a circular fashion facing a central tower. The cells are such that the inmates cannot see individuals in adjacent cells and are positioned in relation to the central tower so that cells geographically opposite a given cell cannot be seen (see Figure 2.3). Furthermore, the cells are lit from behind so that the inspector in the central tower can see the inmate clearly, but the tower is designed in such a way that no inmate can ever see the inspector. No inmate is then able to know for certain whether or not s/he is under observation. The idea is that inmates are then obliged to assume an attitude of being under permanent surveillance even when the inspector is not looking, or not even in the tower, and are therefore forced to discipline themselves.

Bentham never tired of arguing for the use of the panopticon design in prisons, hospitals, schools and factories so that the maximum utility/happiness could be produced by subjects occupying those social spaces (see Bentham, 1995). While the design, in its specifics, was never really used extensively, the important thing is that the principle certainly was and is used: as a negative consequence of the attempt to realise the maximisation of happiness (and usefulness), individuals have to be subjected to continuous surveillance, ironically producing a source of displeasure. Perhaps today we have come the closest yet to the realisation of a Benthamite universe with the recording of our movements and consumption of pleasures in electronic databanks as we increasingly perform transactions that are electronically registered. In many cities today our movements are also recorded by surveillance systems inside buildings and even out in the street

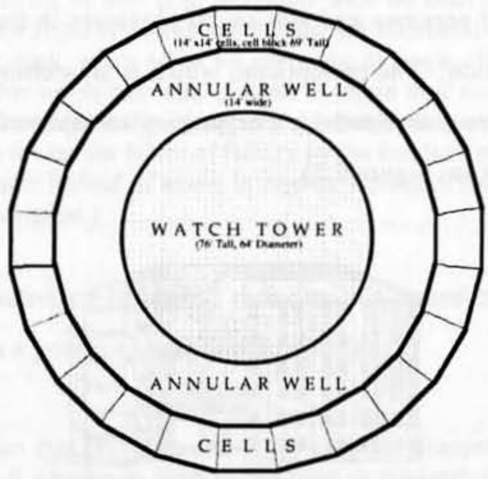


Figure 2.3: Organisation of cells in the panopticon

Schooling has, for some time now, put Bentham's idea of continuous surveillance into operation, as Foucault and others have demonstrated (cf. Walkerdine 1989, 1990; Donald, 1992; Galant, 1996, for example.) The regulation of education conterminous with so-called "traditional teaching" is often described as meeting student transgression with immediate, public punishment, and has giving way to the idea of the "facilitation" of learning in which the individual student's "needs" and cultural uniqueness are recognised and "understood" rather than punished as transgressions (postmodern multiculturalist tolerance, for example). Has surveillance disappeared in this new system along with legislating that corporal punishment is illegal? No, the new gentle techniques of disciplining the student have the effect of multiplying strategies of surveillance and control, of making surveillance even more intense and invasive. Whereas with "traditional teaching" the pleasures of the student (peer group, "cultural", familial) were expected to be left outside the school gates, now we invite students to "share" these pleasures; where previously a whole world of student pleasures was, in effect, kept secret from us, now we insist on being let into that world and subjecting it to scrutiny.

Returning to Curriculum 2005, one of the criticisms announced by the committee charged with reviewing the curriculum was that it embodies contradictory pedagogic principles: on the one hand it attempts to incorporate progressivist pedagogic techniques, while at the same time it demands that the "outputs" of education be organised for and expressed in the form of behavioural objectives ("outcomes").

> The philosophy of progressive learner-centred education, outcomes-based education and an integrated approach to what is to be learnt, have all influenced the design of C2005. But this has resulted in certain incompatibilities. (Chisholm *et al.*, 2000: 30-31)

Notwithstanding progressivism's rhetorical anti-utilitarianism, what Bentham's propositions allow us to see is that the simultaneous occurrence of elements of progressivism and explicit statements announcing the instrumental, use-value of pedagogic action and knowledge are not incompatible, provided we recognise that the new curriculum is structured along utilitarian lines. Progressivism is precisely an assemblage of pedagogic techniques that invade the privacy of the student—that insist on the student confessing their secret pleasures and making those available for public scrutiny—to be used by the teacher to fashion a cooperative learning environment (or "classroom culture"). The knotting together of progressivist pedagogic techniques with a presentation of knowledge as integrated and elements of Outcomes-Based Education (OBE) might be understood as a thoroughly Benthamite gesture. We can perhaps say that Curriculum 2005 proposes that, at the level of the pedagogic subject, to be useful is to be happy; and knowledge is relevant if it is apparently immediately useful (that is, reflects the everyday experience and apparent desires of the pedagogic subject, hence causing happiness).

We can now see that the utilitarian shift in official pedagogic discourse occasioned the necessity for changes in the composition and presentation of curriculum materials, like textbooks. The previous "traditional" curriculum materials were no longer adequate. They represented an "authoritarian" era in which the uniqueness of the student was excluded, where students' individual "needs" were not taken into consideration. How this change comes to be reflected in curriculum materials for the teaching and learning of school mathematics is in the way in which the idea of pleasure is used to produce an exhortation to enjoy in ways compatible with a utilitarian moral order. At the level of curriculum the backgrounding of disciplinary authority—that is, knowledge-based authority—was achieved by appealing to the notion of "relevance": rather than organising the curriculum around intra-disciplinary problems as the motor driving the elaboration of disciplinary knowledge, those who appeal to "relevance" emphasise the importance of solving "real" problems, pointing out that "real" problems routinely demand the integration of knowledge derived from a wide range of disciplines for the production of a solution. From this fact they curiously conclude that the school curriculum should organise and package knowledge in an already-integrated fashion, designed to tackle the problems of so-called "real" life. Hence the organisation of knowledge in the form of useful, integrated "learning areas" rather than pure disciplines, as well as the endemic reference to the everyday and extra-mathematical.

At the level of pedagogic practice, correlative to the backgrounding of disciplinary knowledge is the transformation of the teacher into a "facilitating educator," which is nothing other than a backgrounding of displays of the teacher's possession of disciplinary knowledge. One of the ways in which teachers are being persuaded to accept this change is through widespread trashing of displays of authoritative teaching as "authoritarian," as "chalk-and-talk" and as teaching for "rote-learning." In that way exhibitions of mastery of disciplinary knowledge by teachers are undermined by painting such exhibitions as an indicator of an oppressive will to power that disrupts the happiness, and so the pleasure, of the student. Teachers are consequently forced to confront the problem of finding ways to transmit specialised knowledge in a manner that avoids having the student experience the labour of acquisition as a form of oppression, or, perhaps more accurately, to avoid having student acquisition of specialised knowledge described as a species of oppression.

At this point we should note an important deviation from that of the pedagogic constructivists. For the constructivists the appeal to the everyday served as a resource intended to force the student to confront the limits of their knowledge of mathematics, while for the utilitarians mathematics becomes a resource for solving problems that stem from the extra-mathematical. The learning trajectories produced by the two positions are entirely different. The pedagogic constructivists sequenced mathematics content in terms of a strong theory of vertical conceptual progression, derived primarily from the work of Piaget and von Glasersfeld. The utilitarians, as the review of Curriculum 2005 revealed, subjected the elaboration of mathematics contents to a principle of horizontal coherence derived from the extra-mathematical which resulted in the disruption of vertical conceptual progression. In other words, the appeal to the extra-mathematical is intended to function in very different ways for the two positions: the pedagogic constructivists attempted to employ the everyday to address a conceptual lack at the level of the student while the utilitarians employ the everyday to address a lack they perceive as internal to mathematics, namely, its non-sensible ("abstract") character (or, differently stated, its predominantly intelligible character).

2.5 Summary

What our analysis of the contemporary content of the distributive rule has revealed is as follows. The material base facilitating the circulation of commodities (that is, the flow of capital) demands forms of social relations within the division of labour that balk at the external imposition of boundaries. At the level of the individual subject the imposition of boundaries are to be experienced as a traumatic encounter with displeasure. However, how the individual subject comes to so experience externally imposed boundaries is not in any way spontaneous, but is the result of the work done by the moral order through agencies of symbolic control. The negation of boundaries produces, as "collateral damage," the derogation of traditional authority relations, discomfort with the close proximity to the pleasure of others and, at the levels of curriculum and pedagogy, an attack on all realisations of strong boundary maintenance. The particular configuration of the moral order normalising the series of effects produced by the negation of boundaries is presently that of contemporary utilitarianism.

So, having begun with a consideration of the content of the distributive rule, we find ourselves squarely within the moral order, which is the support for the normalisation of the particular distribution of social goods, including forms of knowledge and consciousness. With that, we have moved onto the terrain of the recontextualising rule of the pedagogic device, which is the subject of the next Chapter.

Chapter 3

Pedagogic discourse and the problematic of pleasure

3.1 The occulting of the problematic of pleasure in Bernstein

In our discussion of the content of the distributive rule in Chapter 2 we found that the moral coordinates generated by the principle of distribution are those of contemporary utilitarianism. Social order, for utilitarianism, derives from the individual subject's relation to pleasure where, so the utilitarians presume, the offer of a minimisation of displeasure renders the subject calculable, hence amenable to social control. The marker of the moral order in Bernsteinian theory, outside of the Durkheimian forms of social solidarity, is found in pedagogic discourse, in the relations between the instructional and regulative discourses at the level of the recontextualising rule of the pedagogic device. However, there are no terms within the theory that enable us to grasp, other than at a very general level, the operation of pleasure in pedagogic discourse. Bernstein's very general theoretical engagement with pleasure is to be found in the relation between desire and the notion of classification, as he himself points out:

Now so far we've just looked at relationships between, which give us category relationships and from that we go to classification. If you like, the secret of the classification is invisible, because it's the insulation. That takes us to power and to the policing of the principle, if you break it. As you acquire the classification you acquire the voice of the other and therefore there's always the potential for disorder. It is at this level that the thesis connects with psychoanalysis, if you want to take it that way. At one time I was going to connect it with Lacan, but then I decided not to because he wrote poetry. [Laughter] I was not going to go through the torture of trying to understand that. And I felt that I ... I didn't go down that route. Other people can use it very successfully. I find that it's not for me. I mean, I admire him for what he did ... and what he does. ... I think that one of the reasons that I didn't work from Lacan was because I am very empirically minded, and Lacan's system is built up without any real clinical practice. There is virtually no clinical practice to Lacanian psychoanalysis. Five minutes is all you get. It costs you about three thousand franc for that five minutes. [Laughter] I got other things I can do my three thousand francs which will last longer than five minutes if I were young! [Laughter] You see, that's the problem with tape recorders. [Laughter] Okay. So where are we? Oh yes, so that's how it connects. And that's how you get desire in the theory. So people who say there's no desire in the theory simply don't understand it. Or they don't want to understand it. Or it doesn't look as if you can do it, because these are all very formal ... derivations. But they are empirical. And when I say the voice of the other is there, that is a matter for empirical investigation. (Bernstein, 1994: Session of Tuesday 1 November)

Moving from classification to desire is a move precisely from the generation of a *what* (classification; relations between; distributive rule) to the moral order. That the problem of desire is bound up with the moral order and pleasure is more clearly expressed in the work of Kant (from which Lacan, in part, developed his own notion of desire).

Life is the faculty of a being by which it acts according to the laws of the faculty of desire. The *faculty of desire* is the faculty such a being has of causing, through its representations [*Vorstellungen*], the reality of the objects of these representations. *Pleasure* is the representation of the agreement of an object or an action with the subjective conditions of life, i.e. with the faculty through which a representation causes the reality of its object. (Kant, 1993: 46; italics in the original.)

For Kant, the problem of the moral law (duty) is bound up with the problem of pleasure in the sense that acting in accord with the moral law is possible only when we act solely for the sake of duty and remain indifferent as to whether our actions produce either pleasure or displeasure.

But this distinction of the principle of happiness from that of morality is not for this reason an opposition between them, and pure practical reason does not require that we should renounce the claims to happiness; it requires only that we take no account of them whenever duty is in question. (Kant, 1993: 97)

In other words, to act morally is to be indifferent to all pathological reasons for acting. For Kant, everyday life, bound up as it is with pleasure and displeasure, is thoroughly pathological. By the term *pathological* Kant is not suggesting that everyday life is perverse, but rather that it is constantly caught up in the problematic, pathetic experience of pleasure/displeasure as determinations of the will. The truly moral, as opposed to the mere legal is, for Kant, beyond the pleasure principle. What we should note with regard to Bernstein's claim that desire is written into the theory (and hence pleasure, as Kant shows), subsumed in the notion of classification, is that the notion of classification is clearly insufficient, for, if it was sufficient there would be no need to call up (and then dismiss) Lacan. In the extract from Bernstein's seminar quoted earlier, the name Lacan is a stand-in for what is absent from the theory as concerns desire and pleasure.

We believe that Bernstein is correct when he claims that the theory connects with psychoanalysis in the notion of classification. However, our argument in Chapter 2 has demonstrated that while everything starts from the assertion of power (classification; the distributive rule), the actual mechanics of the operation of pleasure are to be grasped at the level of regulative discourse. In this Chapter we trace the development of the notion of pedagogic discourse in order to mark the point at which a direct engagement with the problematic of pleasure is excised from the trajectory of theoretical development. This exercise will also enable us to locate the point in the current state of the theory where we might endeavour to reconstitute attention to the functioning of pleasure.

3.1.1 Bernstein and the language of (mis)education

Halliday (1995: 127) usefully summarises the focal problem of Bernstein's early work as follows:

Given (a) that native wit is not determined by social class, and (b) all children now receive equivalent basic schooling, why are those children who *fail* to become educated almost all from the lower working class? This was the question that Bernstein set out to answer, when he was teaching in inner London in the late 1950s. He began by explaining it in terms of perception: Working class children learn to be sensitive to content, and to perceive of phenomena in terms of the boundaries between them, whereas middle class children learn to be sensitive to structure, and to perceive phenomena in terms of the relationships of one to another. But early on in his work he came to see that the differences were essentially semiotic: differences in the way the children learn to *mean*. The sources therefore had to be found in language.

While the early, more sociolinguistic, theory focused on language and what Bernstein referred to as "speech systems," the work of Durkheim and Parsons served as chief resources for rendering the problem and theory in sociological terms. Durkheim's account of the forms of social solidarity—*mechanical* and *organic*—functioned then, and throughout the subsequent development of the theory, as a ground supporting the generation of a succession of conceptual pairs, operating at different levels of analysis and description (cf. Davies, 1994). The notions of *public* and *formal languages* (Bernstein, 1961), for example, are respectively described in terms of mechanical and organic solidarity. Another example is that of the notions of *positional* and *personal family* interpersonal relations, once again, respectively, grounded in mechanical and organic solidarity; or, in terms that free those conceptions from Durkheim's teleological deployment of the forms of social solidarity, *similar to* (mechanical solidarity) and *different from* (organic solidarity) social relations.

From the Parsonian *system of action* and the sociology of the family, Bernstein recruited the notions of *expressive* and *instrumental roles/activity/orientations*, briefly flirting with describing the actions of social agents in terms of *means* and *ends* (Bernstein, 1977a). Parsons described social action as goal-oriented (instrumental), that is, as seeking some or other end, while operating within a system of values (expressive). Bernstein (1990) locates the source of Parsons' idea of goal-orientation in Adam Smith's notion of the division of labour but curiously fails to comment on the explicit recruitment of Freud by Parsons—or at least the Freud of American ego-psychology—in the latter's description of social relations as relations between an *ego* and an *alter*. Parsons' Freud is, however, the Freud of the *pleasure principle-reality principle* relation, and not yet the Freud of *beyond the pleasure principle* whose subject could no longer be trapped in systems of rational social action (that is, of the "servicing of goods"). Merton nicely captures the problem a Durkheimian Bernstein would have faced at the time.

> Durkheim seeks to combat individualistic positivism which ignores the relevance of social ends as partial determinants of social action. He is hence faced with a perturbing dilemma: as a positivist, to admit the irrelevance of ends to a scientific study of society; as an anti-individualist, to indicate the effectiveness of social aims in conditioning social action, and thus in effect to abandon radical positivism. For, if, as positivism would have us believe, logic and science can deal only with empirical facts, with sensa, then a science of social phenomena, on that score alone, becomes impossible, since this attitude relegates to limbo all ends, i.e., subjective anticipations of *future* occurrences, without a consideration of which human behaviour becomes inexplicable. Ends, goals, aims, are by definition not logico-experimental data but rather value judgements; and yet an understanding of social phenomena requires a study of their role. This does not involve a determinism-teleology embarrassment, but simply notes the fact that subjectively conceived ends—irrespective of their recognition of all pertinent data in a given situation—as well as "external conditions," influence behaviour. To ban ends as "improper" for scientific study is not to exempt sociology from metaphysics, but to vitiate its findings by a crude and uncriticized metaphysics. (Merton, 1934: 331-32; italics in the original.)

Bernstein's answer, which avoids the use of the means-ends schema, is that the division of labour and relations within the division of labour produces a social structuring of the subject's orientation to meaning, as we saw in Halliday (1995). Without explaining why, Bernstein abandoned the Parsons/Merton means-ends description of social action but retained from Parsons' predication of expressive and instrumental action/roles the ideas of the regulation of practices *between* systems (instrumental) and the regulation of values *within* a system (Parsons, 1951; Bernstein, 1990). In addition, Parsons (1951) characterised his need-disposition system in terms of *what* (gratificational aspect; cathectic orientation) and *how* (patterns of organisation), yet another pair of terms that Bernstein would use extensively in the development of his theory. Parsons (1959) had drawn attention to two axes of social action: an *axis of integration at the level of collective values* (expressive) and an *axis of achievement* (instrumental) and also argued that expressive activity was fundamental and organised "in terms of a cultural pattern of value orientation." In other words, the expressive, which is fundamental, is socially structured and so provides the social structuring for the definition and attainment of instrumental goals/ends. It follows that the expressive structures both the means and the ends of social action. Durkheim's mechanical and organic solidarity, Merton argued, could be taken as modes of the expressive without being strictly tied, respectively, to simple and complex divisions of labour (Merton, 1934; Parsons, 1934), so that we can observe forms of social solidarity corresponding to mechanical and organic solidarity in any society. Merton also argued that both forms of the law—*penal* and *restitutive*, associated by Durkheim with mechanical and organic solidarity, respectively—are found in every society.

We can now begin to recognise that many of the notions used by Bernstein to describe the so-called "speech systems" of the lower working and middle classes were circulating in the work of Durkheim and Parsons. Bernstein translated Parsons' expressive and instrumental activities/roles into *cultures* (of the school), and then into *orders* (Bernstein, 1966/1977b).

I propose to call that complex of behaviour and activities in the school which is to do with conduct, character and manner the *expressive order* of the school, and that complex of behaviour, and the activities which generate it, which is to do with the acquisition of specific skills the *instrumental order*. (Bernstein, 1977: 38; italics in the original.)

While never fully explaining his move from the notion of the instrumental in Parsons to that of the instrumental culture/order of the school, it would appear that Parsons' (1951) argument that within an instrumental orientation, a *cognitive mode of motivational orientation* is primary, informed Bernstein; the other modes of motivational orientation in Parsons' system were *cathectic* and *evaluative*. Initially Bernstein attempted to distinguish between social relations as structured by the instrumental and expressive orders of the school in terms of bureaucracy and ritual.

Although there is clearly only one order within a school, it is useful to distinguish two different orders of relation which control its transmission and the response to its transmission: an instrumental order which controls the transmission of facts, procedures and judgements involved in the acquisition of specific skills, and an expressive order which controls the transmission of beliefs and moral system. Both of these orders can be distinguished in terms of the forms of social relations which control the transmissions. The forms of social relation of the instrumental order are bureaucratic, whilst the forms of social relation of the expressive order are non-bureaucratic. [...] The expressive order can be considered as a source of the school's shared values and is therefore potentially cohesive in function, whilst the instrumental order, on the other hand, is potentially divisive. It is the expressive order which is the major mechanism of social consensus and thus under certain conditions is prone to extensive ritualization. (Bernstein, 1966/1977b: 54-5)

Once again, the similar to/different from (mechanical solidarity/organic solidarity) distinction can be seen structuring the discussion. Bernstein abandoned the use of the categories of bureaucracy and ritual since he felt that they are inadequate descriptors of the orders of relation of the school. He needed a different formulation, one that enabled him to move away from the Parsonian system. To that end, from Halliday's (1973) description of functional linguistic contexts (seven in all), Bernstein constructed a description of four fundamental socialising contexts:

> I distinguished, reformulating Halliday, four crucial socializing contexts in the family: 'regulative', which positioned the child in the moral system, its backings and practices; 'instructional', which gave access to specific competences for managing objects and persons; 'inter-personal'; and 'imaginative'. (Bernstein, 1990: 97)

Bernstein's earlier description of Halliday's contexts is perhaps somewhat more informative:

> (1) The regulative contexts: these are the authority relations where the child is made aware of the moral order and its various backings.
> (2) The instructional contexts: here the child learns about the objective nature of objects and acquires various skills.
> (3) The imaginative or innovative contexts: here the child is encouraged to experiment and re-create his world on his own terms and in his own way.
> (4) The interpersonal contexts: here the child is made aware of affective states—his own and others. (Bernstein, 1971: 198)

Appealing to Parsons once again, Bernstein argued that the instructional (instrumental order) and the regulative (expressive order) contexts were the most important and were central to issues of social control, effectively dispensing with further theoretical consideration of the two additional contexts—imaginative and interpersonal—derived from Halliday. In establishing his break from Parsons at this point, the categories that potentially kept the theory more explicitly in touch with the problematic of pleasure were jettisoned. Here we should note that Halliday's regulative, imaginative and interpersonal contexts can all be understood as components of Parsons' category of the expressive, oriented as it is in the latter's system towards the "organisation of the 'flow' of gratifications (and of course the warding off of threatened deprivations)" (Parsons, 1951: 49). In other words, the relation between pleasure and displeasure was originally part of the story in Parsons' account of the structuring of the social, and what we have in Bernstein's move from the expressive to the regulative is the condensing of the problematic of pleasure in the regulative. It appears to be the case that without us illuminating Parsons' important contribution to Bernstein's theory, the problematic of pleasure is occulted by the category of the regulative and perhaps, in effect, excised from Bernstein's sociology of education. It is here that we find the point at which the problematic of pleasure might be recovered in Bernstein. However, Bernstein's story does not end here, and the story becomes clearer as we follow the subsequent elaborations of and in relation to the category of the regulative.

3.1.2 From the regulative to the evaluative

The categories of socialising contexts, instructional and regulative, were later transformed into the component *discourses* of *framing* in Bernstein's theory. At one point Bernstein defines the relation between the two discourses within framing as follows:

Further, any given framing positions the acquirer in an embedded pedagogic discourse. Rules of social order, relation, and identity are embedded in rules of discursive order (selection, sequence, pace, and criteria). The first we have called *regulative* and the second *instructional* discourse. (Bernstein, 1990: 108; italics in the original.)

Here the regulative discourse is apparently embedded in the instructional discourse, but note that the definition of instructional discourse is not the definition finally settled on. Later, when *pedagogic discourse* proper comes to be defined, the order of the discourses are swapped around so that the instructional is then embedded in the regulative:

We shall define pedagogic discourse as the rule which embeds a discourse of competence (skills of various kinds) into a discourse of social order in such a way that the latter always dominates the former. We shall call the discourse transmitting specialized competences and their relation to each other *instructional* discourse, and the discourse creating specialized order, relation, and identity *regulative* discourse. (Bernstein, 1990: 183; italics in the original.)

Here selection, sequence, pace and criteria are no longer explicitly linked to the instructional discourse. We find that this transformation in the definition of pedagogic discourse is credited to Pedro (1981).

[...] it is only in Pedro (1981), who took over our model, where *instructional discourse* is defined in terms of 'the principles of the specific discourse to be transmitted and acquired' and the regulative discourse as 'the principles whereby the social relations of transmission and acquisition are constituted, maintained, reproduced and legitimated.' (Bernstein, 1990: 211; italics in the original.)

An examination of Pedro reveals that it was in his recruitment of the work of Michel Foucault, specifically of Foucault's notion of discourse, that he rewrote Bernstein's instructional and regulative *contexts* as instructional and regulative *discourses*. However, in Bernstein's later work, *Pedagogy, Symbolic Control and Identity*, the instructional discourse is once again predicated as referring to selection, sequence, pacing and criteria of knowledge. Here pedagogic discourse—elsewhere defined as an instructional discourse embedded in a regulative discourse—*is* framing:

We can distinguish analytically *two* systems of rules regulated by framing. [...] These are rules of *social order* and rules of *discursive order*. [...] First, the rules of social order refer to the forms that hierarchical relations take in the pedagogic relation and to expectations about conduct, character and manner. [...] Second, there are rules of discursive order [which] refer to selection, sequence, pacing and criteria of the knowledge. We shall call the rules of social order *regulative discourse* and the rules of discursive order *instructional discourse*. [...] In other words, the instructional discourse is always embedded in the regulative discourse, and the regulative discourse is the dominant discourse. And we shall then write this as follows:

$$\text{framing} = \frac{\text{instructional discourse}}{\text{regulative discourse}} \quad \frac{ID}{RD}$$

(Bernstein, 1996: 27-8; italics in the original.)

One way of resolving the confusion and ambiguity of the predication of the theoretical terms is to argue that pedagogic discourse is the name for framing in the context of the notion of the pedagogic device. In other words, the *recontextualising rule* of the device is about framing, or, control. The *distributive rule* of the device is another name for classification. The values of classification and framing give us a description of the educational code in any given pedagogic context, and we know that the notion of code emerged from the early investigation of semantic *orientations* in the context of the analysis of mother-child relations, of more general family relations, and of class-biased "speech systems," all of which predisposed the pedagogic subject to approach knowledge in a specific manner. For example:

These characteristics [of public and formal language] must be considered to give a *direction* to the organisation of thinking and feeling rather than to the *establishing* of complex modes of relationships. (Bernstein, 1961: 311; italics in the original.)

The notion of code was used to draw together socio-cultural specificity, linguistic and semantic orientation:

The concept code refers to the transmission of the deep meaning structure of a culture or sub-culture: the basic interpretive rules.

Codes on this view make substantive the culture or sub-culture through their control over the linguistic realizations of contents *critical* to the process of *socialization.* (Bernstein, 1971: 198; italics in the original.)

And:

The empirical search for contextual realizations of the codes together with the need to build into their basic definitions to the speech realizations of critical socializing contexts, led to a new formulation which brought out into the definition the stress on the social structuring of relevant meanings.

I was always aware of the impossibility of assigning any given stretch of speech or writing to one or other of the codes without some prior knowledge of the evoking social context. (Bernstein, 1971: 11)

In his discussion of the pedagogic device, where we see that the correlates to classification and framing are, respectively, rendered as distributive rules (power) and recontextualising rules (control; ID/RD), Bernstein found it necessary to add a third category of rule—the *evaluative rule*—focussed on the criteria for the production of legitimate utterances in the pedagogic context. We see in this move a dawning realisation of the necessity to write into the theory a term which captures the fact that, although pedagogic subjects may well be predisposed to specific class-biased forms of cognitive orientation, or coding orientations, all are subject to criteria that are specific to the discourses to be acquired. The early research had demonstrated over and over how members of the working classes are predisposed (and perhaps encouraged) to misrecognise the criteria of the elaborated code of schooling, and so end up failing to be educated.

In addition, we detect in the later formulation of *horizontal* and *vertical discourses* (Bernstein, 1999) a promise to further elaborate the theory in order to address the problems, both theoretical and empirical, that inhere in the pedagogic context at the level of the evaluative rule of the pedagogic device. Bernstein (1999: 159) defines horizontal and vertical discourses as follows:

We are all aware and use a form of knowledge, usually typified as everyday or 'common-sense' knowledge. Common because all, potentially or actually, have access to it, common because it applies to all, and common because it has a common history in the sense of arising out of common problems of living and dying. This form has a group of well-known features: it is likely to be oral, local, context dependent and specific, tacit, multi-layered, and contradictory across but not within contexts. However, from the point of view to be taken here, the crucial feature is that is it segmentally organised. By segmental, I am referring to the sites of realisation of this discourse. The realisation of this discourse varies with the way the culture segments and specialises activities and practices. The knowledge is segmentally differentiated. Because the discourse is horizontal it does not mean that all segments have equal importance, clearly some will be more important than others. I shall contrast this horizontal discourse with what I shall call a vertical discourse. [...] Briefly, a vertical discourse takes the form of a coherent, explicit, and systematically principled structure, hierarchically organised, as in the sciences, or it takes the form of a series of specialised languages with specialised modes of interrogation and specialised criteria for the production and circulation of texts, as in the social sciences and humanities.

In the terms of this later elaboration of the theory, we can say that orientations to meaning differentially produce recognition/misrecognition of the criteria for the production of legitimate utterances: an elaborated coding orientation is shared by schooling in general and vertical discourse, so that those social agents who have access to only restricted coding fail to recognise the criteria for the reproduction of vertical discourse. Bernstein (1999: 157) describes the crack in the theory that was to be filled by the discussion of knowledge structures as follows:

It might be useful to recall the development of the work that leads up to the present analysis. Up to the 1980s, the work was directed to an understanding of different principles of pedagogic transmission/acquisition, their generating contexts and change. These principles were conceptualised as code modalities. However, what was transmitted was not in itself analysed apart from the classification and framing of the categories of the curriculum. In the mid-1980s, what was transmitted became the focus of the analysis (Bernstein, 1986). A theory of the construction of pedagogic discourse, its distributive, recontextualising and evaluative rules, and their social basis, was developed: the pedagogic device. However, the *forms* of the discourses, i.e. the internal principles of their construction and their social base, were taken for granted and not analysed. Thus, there was an analysis of modalities of elaborated codes and their generating social contexts, and an analysis of the construction of pedagogic discourse which the modalities of elaborated codes pre-supposed, but no analysis of the discourses subject to pedagogic transformation. (Italics in the original.)

Returning now to the definition of pedagogic discourse, it would seem that the necessity for talking about two discourses, an instructional *and* a regulative, and marking the regulative as dominant, is a direct result of the recognition of the problem of the recognition/misrecognition of criteria: the distinction drawn between the instructional and the regulative tells us that the criteria of the instructional, as it pertains to the reproduction of specialised knowledge, is different from the criteria demanded by social solidarity; the dominance of the regulative tells us that the mode of social solidarity, which is carried by horizontal discourses, facilitates recognition/misrecognition of the criteria demanded by specialised knowledge (that is, of the elaborated code of schooling). That horizontal discourse is bound up with regulative discourse and the distribution of forms of knowledge and consciousness is clear from Bernstein's description of the relations between social relations, discourses and forms of consciousness, where horizontal discourse is marked as the "major cultural relay":

> The structuring of the social relationships generates the forms of discourse but the discourse in turn is structuring a form of consciousness, its contextual mode of orientation and realisation, and motivates forms of social solidarity. Horizontal discourse, in its acquisition, becomes the major cultural relay. (Bernstein,1999: 160)

We have seen that the embedding of the instructional in the regulative was always present in Bernstein's theory from the beginning, from the social structuring of linguistic and semantic orientations as they were described in terms of Parsons' categories of the instrumental and expressive, as well as later in the notion of code, and then in terms of classification and framing. It would seem that Bernstein's insistence—a necessary one—of constantly relating the theory to the social division of labour and the forms of solidarity generated therefrom, backgrounded, until fairly late in the development of the theory, the importance of the forms of discourse in the theoretical account of the transmission and acquisition of culture.

Figure 3.1 is a simple schematic summarising the theoretical trajectory we have highlighted here.

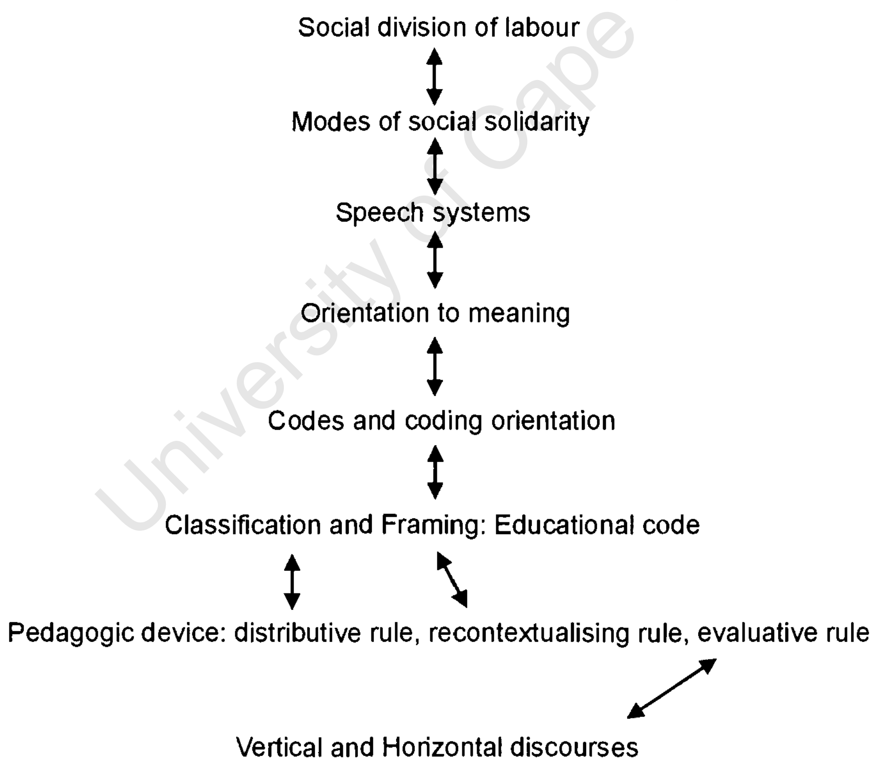


Figure 3.1: Simplified trajectory of the development of Bernstein's theory

At points, especially with reference to the early research on the linguistic forms pertinent to relations within the family, Bernstein does recognise the different ways in which legitimate texts are authorised. For example, in lower working class families, legitimate utterances tended to be authorised positionally, while in middle class families authorisation tended to refer to some or other field of reason outside of the person(al) even though the mode of address is personal. The implications of these different modes of authorising knowledge claims for the reproduction of specialised knowledge are brought out more clearly with the elaboration of the theory of the pedagogic device, where the notion of the evaluative rule indexed the uncovering of a conceptual hole in the theory. It is the embedded nature of pedagogic discourse that produces problems of the recognition and realisation of criteria for the production of the legitimate texts of specialised knowledges. The elaboration of the notions of horizontal and vertical discourses, and the working out of relations between them, is a first step towards tackling the problem of the misrecognition of criteria for the reproduction of specialised knowledge.

3.2 Social solidarity, horizontal discourse and the problem of pleasure

Pleasure is intimately bound up with the practices of everyday life, not merely in the simple sense of our seeking out the conditions for minimisation of displeasure, but more importantly in the sense that we all, no matter what our position in the social hierarchy, engage in social relations that produce pleasure. In addition, Freudian and Lacanian psychoanalysis teaches that all of us tend to presume that the other enjoys forms of pleasure that are alien, perhaps even disturbing, to us. The presumption of some unfathomable enjoyment possessed by the other is at the heart of envy and of phenomena such as hatred of the other, as in racism. When, for example, we speak of some or other social or national group and their distinguishing social practices, we are at the same time imputing to them a peculiar mode of enjoyment, one which escapes us. Entry into the sphere of a new social group immediately brings us into confrontation with the peculiar form of enjoyment of the other as well as with the enjoyment we are presumed to possess: even though we might satisfy all explicit criteria, the observance of a whole host of implicit social rules acts as the true marker of belonging. All of this happens within horizontal discourse, the discourse of everyday life. The point is that the moral law, in its broadest sense, consists not only of explicitly stated rules, but also of unwritten rules, the distribution of knowledge of which produces a differentiation between social groups bound up with a differentiation between different forms of enjoyment. So, when we speak of the distribution of social goods, including forms of knowledge and consciousness, we should not fail to recognise that such distribution does not happen outside of an encounter with forms of enjoyment. A direct encounter with the enjoyment of the other happens at the level of the evaluative rule, where the actual work of the reproduction of culture and of the social division of labour takes place.

In Chapter 2 we argued that the way in which pedagogy engages with the forms of enjoyment of the student has undergone a transformation in the passage from apartheid education to contemporary utilitarian education. Postmodern multiculturalism—the discourse of tolerance towards the enjoyment of the other—which is now firmly entrenched in curriculum statements, requires that we "understand" the peculiar forms of enjoyment of the other. Žižek (1999: 216; italics in the original), drawing out the link between the multiculturalist mantra of cultural tolerance and global capital, argues that "the ideal form of ideology of this global capitalism is multiculturalism, the attitude which, from a kind of empty global position, treats *each* local culture as the colonizer treats colonized people – as 'natives' whose *mores* are to be carefully studied and 'respected'."[8] Our position is that the point of this, apparently more egalitarian, respect for the enjoyment of the other in the context of schooling is the negation of that enjoyment by domesticating it and, as we argued previously, learner-centred pedagogy, with its "gentle" disciplinary mechanisms and total surveillance of the student, is an ideal pedagogic modality for achieving that end. This formulation sheds a different light on the call to integration and relevance at the level of the curriculum: that which is to be "integrated" (rather than violently suppressed) is really the enjoyment of the student, so that the incorporation of segments of horizontal discourse becomes a necessary feature of curriculum, curriculum materials and resources, as well as pedagogy. Bernstein (1999: 169) correctly highlights some of the problems with the incorporation of horizontal discourses into the transmission of vertical discourses:

> As part of the move to make specialised knowledges more accessible to the young, segments of horizontal discourse are recontextualised and inserted in the contents of school subjects. However, such recontextualisation does not necessarily lead to more effective acquisition for the reasons already given. A segmental competence, or segmental literacy, acquired through horizontal discourse, may not be activated in its official recontextualising as part of a vertical discourse, for space, time, disposition, social relation and relevance have all changed. When segments of horizontal discourse become resources to facilitate access to vertical discourse, such appropriations are likely to be mediated through the distributive rules of the school. Recontextualising of segments is confined to particular social groups, usually the 'less able'. This move to use segments of horizontal discourse as resources to facilitate access, usually limited to the procedural or operational level of a subject, may also be linked to 'improving' the student's ability to deal with issues arising (or likely to arise) in the students' everyday world: issues of health, work, parenting, domestic skills, etc. Here, access and recontextualised relevance meet, restricted to the level of strategy or operations derived from horizontal discourse. Vertical discourses are reduced to a set of strategies to become resources for allegedly improving the effectiveness of the repertoires made available in horizontal discourse.

Here Bernstein is restating the incommensurability thesis discussed in Chapter 1. From our perspective, however, his comments on the incorporation of horizontal discourse into schooling masks the point to be made with respect to the demand of capital for the dissolution of boundaries. The situation is rather more complex than an appeal to mere pedagogic populism, as he argues (ibid.):

> However, there may be another motive. Horizontal discourse may be seen as a crucial resource for pedagogic populism in the name of empowering or unsilencing voices to combat the elitism and alleged authoritarianism of vertical discourse. Here, students are offered an official context in which to speak as they are thought to be: Spon-tex (the sound-bite of 'spontaneous text').

Contrary to appearances, pedagogic populism is no threat to global capital. Rather, the phenomenon of pedagogic populism is precisely one of the effects of the logic of capital on the structuring of pedagogic discourse. One of the major ideological effects of pedagogic populism is the generalisation of the view of knowledge as private property: when the pedagogic subject is persuaded

[8] Žižek's point can also be made to apply to contemporary marketing strategies and advertising, provided we read his ironic 'respected' as meaning commodified.

that they are already in possession of valid knowledge, even prior to their participation in formal pedagogic relations, they are simultaneously persuaded that they possess knowledge *which can be exchanged* with others in a similar position.[9] In other words, pedagogic populism is nothing less than a strategy for the general acceptance of the commodification of knowledge, in the guise of the democratisation of access to knowledge.

Bernstein refers to populist pedagogic models as *competence models*, the "social logic" of which he describes as follows:

> By social logic I am referring to the implicit model of the social, the implicit model of communication, of interaction and of the subject which inheres in this concept. I would suggest that an analysis of the social logic of competence reveals:
>
> 1. an announcement of a universal democracy of acquisition. All are inherently competent and all possess common procedures. There are no deficits;
> 2. the subject is active and creative in the construction of a valid world of meanings and practice. Here there are differences but not deficits. Consider creativity in language production (Chomsky), creativity in the process of accommodation (Piaget), the *bricoleur* in Lévi-Strauss, a member's practical accomplishments (Garfinkle);
> 3. an emphasis on the subject as self-regulating, a benign development. Further this development or expansion is not advanced by formal instruction. Official socializers are suspect, for acquisition of these procedures is a tacit, invisible act not subject to public regulation;
> 4. a critical, sceptical view of hierarchical relations. This follows from (3) as in some theories the socializers' function should not go beyond facilitation, accommodation and context management. Competence theories have an emancipatory flavour. Indeed in Chomsky and Piaget creativity is placed outside culture. It inheres in the working of the mind;
> 5. a shift in temporal perspective to the present tense. The relevant time arises out of the point of realization of the competence, for it is this point which reveals the past and adumbrates the future.
>
> (Bernstein, 1996: 55-6; italics added)

We can immediately recognise in Bernstein's description of the social logic of competence parallels to central features of the structuring of social relations we drew attention to when discussing commodity exchange in Chapter 2, specifically the weakening of boundaries and the critical view of hierarchical relations. An examination of official pedagogic discourse, from the African National Congress (1994) policy statement on education to the current Revised National Curriculum Statements (RNCS), the first of which appeared in 2002 (for Grades R to 9), reveals that the general educational orientation of the state concurs with Bernstein's description of the social logic of *competence*. Since 1994 in South Africa the distance between official pedagogic discourse and the discourse circulating in higher education teacher training has virtually disappeared so that there is a general convergence in the education arena towards the privileging of competence models.

Bernstein further argues that the central feature of competence models is that of the structuring of education along the lines of *similar to* relations:

[9] Lectures and seminars become workshops and, in school classrooms, exposition is replaced by groupwork. Workshops and groupwork are examples of pedagogic technologies that call for the horizontal exchange of knowledge between participants. What is it that participants exchange at the level of the reproduction of knowledge? Only that which they already possess: their opinions dressed up as knowledge, or, differently stated, horizontal discourse dressed up as vertical discourse.

In the case of competence models there is a focus on procedural commonalities shared within a group. In the cases we have analysed the group is children but procedural commonalities may well be shared with other categories, e.g. ethnic communities, social class groups. From this point of view competence models are predicated on fundamental 'similar to' relations. (Op.cit.: 64-5)

In other words, the central organising principle of competence models is one which emphasises the self-recognition of the pedagogic subject in others and in knowledge. Metaphorically, it is a principle encouraging an apparent mirroring back to the pedagogic subject of him/herself. This formulation raises a rather interesting question. When we refer to pedagogic relations within the context of competence models as similar to relations, are these relations simply of the form pertaining to mechanical solidarity as defined by Durkheim and Bernstein? Clearly that cannot be the case since, as we argued in Chapter 2, the shift from societies of mechanical solidarity to societies of organic solidarity also entails a shift from fetishism at the level of social relations to fetishism at the level of the circulation of commodities, so that similar to relations within a society subject to commodity fetishism cannot be of the same type as similar-to relations within a society of mechanical solidarity. A crucial difference between societies of mechanical and organic solidarity to note here is that of the relation to property. With societies of mechanical solidarity the mass of people are under relations of "domination and servitude" and do not own private property, whereas with organic solidarity everyone owns property or, at least, has no choice but to live under the rule of the economic principle of the private ownership of property. Therefore, even where we encounter social groups exhibiting strong communal bonds today, each individual within such groups is at the same time subject to the principle of the private ownership of property. Similar to relations within contemporary social formations, while they may well exhibit some of the features of simple mechanical solidarity, must be understood as being, essentially, narcissistic. In other words, the similar to other to whom we relate as modern abstract citizens is ourselves. In this way, contemporary similar to relations are not antagonistic to the *different from* relations demanded by societies of organic solidarity; in fact, narcissistic similar to social relations can be conceived of as the limit point of different from relations.

At this point we need to introduce the necessary features of psychoanalytic theory that will enable us to produce a more theoretically informed reading of the type of pedagogic relations produced under the conditions of a society subjected to the demands of contemporary capital.

3.3 Pleasure versus *jouissance*

Up to now we have been using the terms pleasure and enjoyment in their everyday sense and we are rapidly approaching the point in our argument where those everyday meanings prove inadequate. More specifically, we need to introduce a distinction between pleasure as it is commonly understood, and enjoyment (*jouissance*) as it is predicated within Lacanian psychoanalysis. Fink (1995: 60) introduces the notion of Lacanian enjoyment by pointing out that "pleasure may turn to disgust and even to horror, there being no guarantee that what is most exciting to the subject is also most pleasurable. That excitement, whether correlated with a conscious feeling of pleasure or pain, is what the French call *jouissance*." The Lacanian notion of enjoyment is therefore of a form of satisfaction that, formally, is indifferent to pleasure and pain, and so escapes the circuit of the pleasure principle. By way of offering an initial example of an encounter with *jouissance*, Fink (ibid.) draws attention to the "Rat Man," to whom Freud attributed a "horror at pleasure of his own of which he himself was unaware" (*SE X*: 167). The "pleasure" to which Freud is referring is a form of pleasure that could not be subjectivised by Rat Man; that is, of a paradoxical pleasure that is at the same time displeasure—pleasure to which Rat Man could only respond with a distancing horror once becoming aware of it. However, as already indicated in Fink's formulation, *jouissance* need not consciously be correlated exclusively with displeasure, from which it follows that it is not to be thought of as a pathological form of pleasure that pertains only to psychic illness. It is, in fact, the name for the form of enjoyment associated with the *drive* in psychoanalytic theory. While there is much that can be said about *jouissance*, for now we are interested in a very particular feature of *jouissance* in relation to the drive, namely, its peculiar stasis. The drive, in Lacanian theory, always attains satisfaction in its following of a circular trajectory, marked by a compulsion to repeat. The circular compulsion to repeat is for Lacan a circulation around the supposed lost "Thing." This requires explanation.

The Lacanian account of the Thing derives from Freud's discussions of *Das Ding*. Fink (1995) points out that Freud initially describes the Thing by referring to it as that which remains invariable in the perceptions of the infant (of, say, the breast): the "neuron *a*" in the "neuronal complex" corresponding to "a constant portion of the perception complex" (*SE I*, 328). Freud goes on to extend this perception of invariance to the subject who takes care of the infant in its initial extra-uterine state of helplessness: "[T]he complex of a fellow creature falls into two portions. One of these gives the impression of being a constant structure and remains as a coherent 'thing'" (*SE I*, 331). As concerns that which is variable in the infant's "perception complex," and hence in its corresponding "neuronal complex," referred to by Freud as "neuron *b*" (*SE I*, 328), the latter forms associations with other specific neurons. In Freud's description, "neuron *a*" is isolated from the chain of associations formed by that which is variable, but the chain of associations nevertheless circulates around the invariable kernel, "neuron *a*." The other, a fellow creature, *qua* invariable "thing" is the primordial source of pleasure/pain for the infant and is as such unsignifiable, hence primordially lost. In the terms of Lacan's (1992: 54) rereading of Freud, which translates Freud's biological description into terms of structural linguistics, "*Das Ding* is from the outset what I call the nonsignified. The subject keeps his distance from this nonsignified and from an affective relation to it, constituting himself as a type of relation, characterised by primal affect, that is prior to any and all repression." In other words, even before the subject begins to actively participate in symbolic relations, in language, a primary circular mode of enjoyment is established. The particular structuring of the circulation around the Thing defines the drive and constitutes the primordial *jouissance* of the subject, eventually structuring all of the subject's later, secondary, relations.

The notion of *jouissance* refers to a form of surplus-enjoyment created within the subject's primordial relationship to the original other, establishing the coordinates of the drive. Next, that form comes to structure the subject's activity in general, curving the subject's desire in a particular way. Further, the form takes on the guise of a hypothetical object in the subject's social relations and is given a special name by Lacan: *objet petit a*. What Lacan is aiming at with the notion of *objet petit a* is that the form given by *jouissance* behaves as an object that causes desire. Here it is necessary to distinguish between the *object of desire* and the *object-cause of desire*. The object of desire is the contingently encountered object (commodity, person, activity, and so forth) that is vainly presumed to satisfy desire; the choice of the object of desire is, however, structured by the object-cause of desire.[10] The object of desire is, in effect, a stand-in for the object-cause of desire (*objet petit a*), and it is in this way that we find form rendered as object by the subject. We can now see why desire is metonymic: desire slips from object to object because every phenomenally encountered object of desire is a stand-in, so not quite "it," not the real thing in relation to which *jouissance* was primordially structured.

How all of this plays itself out at the level of social relations requires us to introduce Lacan's three registers, or orders, into the discussion: the Real, the Imaginary and the Symbolic.

3.3.1 The Real, the Imaginary, the Symbolic and *jouissance*

The primordial *jouissance* we discussed in the previous Section is of the order of the Real. The Real is that which is presumed to exist outside of the order of language, meaning and the law, that is, outside of symbolic relations. For now we will say that the latter constitutes the Symbolic order. For Lacan, one way to get a purchase on the notion of the Real is to conceive of it as that which announces itself at the points of failure of the Symbolic. In other words, we can glimpse the Real, from within the Symbolic, as some or other disturbance. From this it also follows that our attempts to negate disequilibrating disturbances within the Symbolic are inducements to further symbolise the Real. In Bernstein's theory one place at which the Real is to be found is in the space of the yet-to-be-thought that is the discursive gap of the pedagogic device (cf. Bernstein, 1996). Knowledge production might then be understood as, in one sense, a continuous attempt to symbolise the Real as it incessantly reappears as the limit of knowledge.[11] Morel (2000: 67) makes the claim that the concern of science is with finding "some knowledge in the real, and then operating with knowledge on the real." For Morel it is possible to gain knowledge of the Real, for if we could not, then it would prove impossible for us to use knowledge in a predictive fashion. More recently, Žižek (2004: 70-71) has also begun to argue, against the standard formulations of the Real as an impossible missed encounter, that we can and do encounter the Real: "for Lacan, the real (sic) is not impossible in the sense that it can never happen – a

[10] For Lacan, "desire is neither the appetite for satisfaction nor the demand for love, but the difference which results from the subtraction of the first from the second—the very phenomenon of their splitting" (2004: 287).

[11] As an example, let us consider Newton's theory of gravitation. For some time it appeared to be the case that planetary motion obeyed the laws of gravitation as defined by Newton, until it was noticed that the path followed by Mercury violated the theory, announcing a point of failure of the theory. The response to this failure was to produce an entirely new conception of gravitation.

traumatic kernel which forever eludes our grasp. No, the problem with the real is that it happens and *that's* the trauma. *The point is not that the Real is impossible but rather that the impossible is Real.*" (Italics in the original.)

Next, the Imaginary emerges from the relations that constitute the subject's identity and is bound up with the notion of the ego and its representation of the subject as a unique, unified individual. The term *imaginary* in Lacanian psychoanalysis refers directly to the productivity of the image in the constitution of the ego. The initial images of the subject within familial relations and broader social relations produce a sedimentation of ideal images constituting the ego. The Imaginary order is therefore the order in which social relations are focused on the image as it pertains to the ego; in other words, imaginary relations are relations between egos, and not hallucinated relations. Such relations differ from symbolic relations in an important way. Whereas imaginary relations are those in which the subject narcissistically relates to the other as ego, within symbolic relations the subject relates to the other as of the Symbolic order: that is, as knowledge, as the law, as morality, as language, and so forth, often referred to as the "big Other" by Lacan. From our descriptions of the Imaginary and the Symbolic we can see that both registers must be operative in pedagogy.

In Figure 3.2, Lacan's schema of the relations between the orders of the Imaginary (I), Symbolic (S) and Real (R), the vertices of the triangle represent the three fundamental structuring dimensions of human existence: the Imaginary is the order of images which humans attend to and identify with; the Real is the rigid traumatic kernel of reality that resists yielding to symbolisation; finally, the Symbolic is the field of language and symbolic structures, of symbolisation. The "J" at the centre of the triangle is the marker of *jouissance*, the traumatic protuberance, from the Real, of primordial enjoyment. The symbols adjacent to the three sides of the triangle describe the relations between pairs of I, R and S and represent the three modes of attempting to normalise *jouissance*.

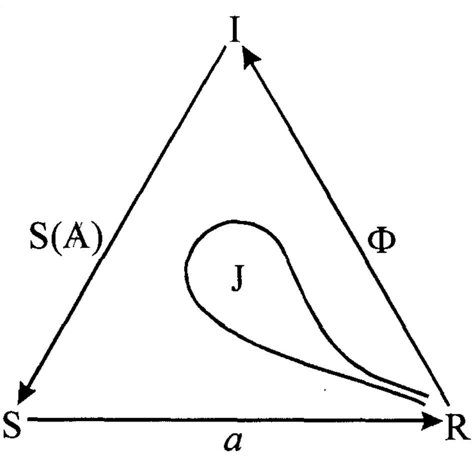


Figure 3.2: Relations between the Imaginary, Symbolic and Real (Lacan, 1998: 83)

The relation Φ:R $\rightarrow$ I represents *jouissance* as the impossible Thing that holds us in a state of deadly fascination, described most aptly by Žižek (1989: 185) as: "the impassive, imaginary objectifications of the Real, an image which embodies *jouissance*."

Next, $S(\not{A})$:I $\rightarrow$ S represents the points of indeterminacy in the Symbolic, its internal limit. For example, in Bernstein (1996: 42 ff.), in the notion of the *discursive gap* as the impossibility of closure, around which the pedagogic device is structured. We should not fail to note here the similarities of Bernstein's notion of the discursive gap with the more carefully elaborated notion of an ineradicable, irreducible *antagonism* as the constitutive impossibility of the social in Laclau & Mouffe (1986).[12] In Dowling (1998: 87-104), inspired by Foucault's discussion of the non-discursive/discursive distinction in *Power/Knowledge*, we encounter the notion of *discursive saturation* which indexes the "excess of the material over the discursive," which is recruited to distinguish between low and high discursively saturated practices. This is yet another rendering of the Lacanian thesis on the so-called "big Other" as lacking and inconsistent in its failure to fully grasp the Real. With the relation $S(\not{A})$:I $\rightarrow$ S *jouissance* takes the form of enjoyment escaping symbolisation, ultimately, an enjoyment escaping the Law.

Finally, the relation *a*:S $\rightarrow$ R is that which appeals to the so-called *objet petit a*, the "little other," as the object which causes the endless metonymy of desire and enables the transferential structuring of relations between subjects by encouraging the presumption of the existence of something in the other "more than himself," this "something" being a pure semblance giving content to what is nothing other than a materialisation of the *form of desire*. The particular content is always contingent and provisional, never quite "it;" if it was, desire would cease. Object *a* functions as an impediment to the closing of the circuit of the pleasure principle—that is, as a source of displeasure from the viewpoint of the pleasure principle—since what is desired is not some or other empirically obtainable content, but rather the continuation of desire itself. Fink (1995: 91) renders the relation schematically as: "cause $\rightarrow$ desire $\rightarrow$ metonymic slippage from one object to the next".[13]

3.3.2 Pedagogic discourse in relation to the Real, the Imaginary, and the Symbolic

The Real is potentially encountered in pedagogic contexts at two points that are of immediate interest to us. First, it is potentially encountered at the level of the instructional discourse at the limits of the knowledge selected for reproduction. More often than not, it is of course the case that knowledge in the field of reproduction is presented in a manner that masks its internal limits. By this we mean that the pedagogic subject is spared an encounter with the points of the failure of knowledge. For example,

[12] Hence their proposition proclaiming the non-existence of society.

[13] The Lacanian triad of I-S-R along with the fourth term, J, can be described in terms of the moments of the judgement in Hegel's theory of judgement, which is discussed in detail in a later Chapter. First, the Real is *impossible* (the judgement of existence); second, it is through the Imaginary that *possibility* circulates (judgement of reflection); third, it is the Symbolic that aims at the production of *necessity* (judgement of necessity); and finally, fourth, it is the radically *contingent jouissance* that links together the three orders, I-S-R (judgement of the notion). (cf. Žižek, 2002: 136-7)

first we learn about the counting numbers and operations on them, then about the "fractions" and operations on them, then "decimal number and fractions," then "negative numbers" and so on, without being confronted with the need to grapple with the points at which, say, the operations on the counting numbers demand the construction of the rational numbers. "Fractions" (rational numbers) are simply the content of the next topic in the teaching sequence, after we have "done" counting numbers. And so it goes on, topic after topic. There is, in principle, no reason why the pedagogic subject cannot be confronted with the points of the failure of knowledge.

Knowledge is never automatically reproduced by the pedagogic subject; there is inevitably a point at which the activity of the pedagogic subject fails. Once again, we should note that the pedagogic subject functions as both the facilitator of and the obstacle to the reproduction of knowledge. The pedagogic subject in its guise as obstacle is not conceived of as merely an instance of epistemological malfunctioning but also as an instance of deviance: as not "concentrating," as not completing homework, not studying for examinations, as lazy, as suffering family problems and so forth. Such evaluations are of course also attached to the subject in their guise as successful facilitator of reproduction: as hardworking, as a good student, as clever and so forth. Whatever the pedagogic subject produces in the pedagogic context is therefore read in two ways. On the one hand there is an evaluation of the enunciations of the subject: is that which is enunciated correct/valid? On the other hand, there is an evaluation of the (hypothetical) position from which the subject produces the enunciation: what type of person is this who produces such an enunciation? In other words, the enunciated is made dependent on the position of enunciation, which is another way of saying that the instructional discourse is embedded in the regulative, because a concern with the subject of the enunciation is ultimately a moral concern. The subject of the enunciation is a subject presumed to be possessed of *jouissance* and pedagogic discourse is always concerned with the effects of that *jouissance* on the reproduction of knowledge.[14]

The Imaginary is immediately present in the pedagogic context in the form of ego-ego relations: generally, the partitioning of inter-subjective relations into those of identification (sameness/love) and of rivalry (difference/hate), all of which are usually fairly volatile and likely to shift. Curricula and pedagogic modalities that are structured as competence models, predicated as they are on "fundamental similar-to relations" (Bernstein, 1996), must then be understood as using the Imaginary as a central resource in the pedagogising of knowledge. With such curricula and pedagogies, the alienation of the pedagogic subject is to be displaced by the image of the subject as always-already identified with the content to be acquired; that is, pedagogic subjects are to encounter themselves in the elaboration of curriculum content, like Gerdes's (1985, 1986) African button weavers who find in their "ethnomathematics" that they have always-already discovered the theorem of Pythagoras. More generally, pedagogic subjects are to experience their everyday activity as always-already identified

[14] In contemporary South Africa, the presence of the (usually Black) pedagogic subject *qua* obstacle is often explained in terms of the difficulties of translating between "cultural differences," the solution to which is multiculturalism.

with mathematics: we are to believe that we routinely do mathematics when we shop, play, do domestic chores, travel and so forth.

Finally, education in general, both formal and informal, is the means by which individuals are inducted into the order of the Symbolic, or what Lacan refers to as the big Other: language, socio-cultural norms, the law, specialised discourses. The Symbolic is constituted by both expressive and instrumental orders; or, stated in purely Bernsteinian terms, both instructional and regulative discourse. A crucial difference distinguishing the Symbolic from the Imaginary is the manner in which the ego is positioned in identification. The name for symbolic identification is *ego-ideal*, and that for imaginary identification, *ideal ego*. The ideal ego is the ego in identification with the image in which subjects appear likeable to themselves (imaginary identification); the ego-ideal is the ego in identification with the *place* from which the subject is observed so that s/he appears likable to him/herself (symbolic identification). Žižek (2002: 11) describes the ego-ideal as "precisely the viewpoint assumed by the subject when he perceives his very 'normal' everyday life as something inverted. This point is *virtual*, since it figures nowhere in reality: it differs from "actual" life as well as from its inverted caricature – that is to say, it cannot be located within the mirror-relationship between reality and its inverted image – as such, it is of a strictly *symbolic* nature." (Italics in the original.) In the terms of the ego-ideal we see ourselves as objects caught up in symbolic systems of differential relations in the Saussurian sense[15] rather than as "personalities"—the latter being the terrain of the ideal ego, where we enumerate what we presume to be the special features of our self-image.

3.4 Summary

Competence curricula and pedagogies are modalities that arise in response to the effects on symbolic control of the contemporary demands of global capital. One of those effects is the production of a narcissistic subject who experiences the external imposition of boundaries, hierarchical relations and the other's pleasure as forms of displeasure. To contend with such a pedagogic subject *and* meet the demands of the principle for the distribution of social goods in a manner compatible with the logic of the structuring of the division of labour and relations within the division of labour, the reproduction of specialised knowledge comes to be organised differently from the previous modality, which privileged strong boundaries and explicit hierarchical relations. The form of social solidarity supportive of these arrangements is one in which everyone is in principle free to engage in their own narcissistic pursuits within a moral order structured by contemporary utilitarianism. Pedagogic discourse within competence pedagogies is obliged to engage the pedagogic subject in two ways: it must reproduce knowledge as apparently pleasurable as well as simultaneously negate the solipsistic pleasure of the pedagogic subject, immersed as the latter is in localised horizontal discourse and the Imaginary.

[15] That is, in the sense of marking the distinction between the signifier and the place it occupies in the signifying network.

The general pedagogic mechanism that does the work of engaging the pedagogic subject in the manner described here is, as it always was, pedagogic judgement. To reveal the specific workings of pedagogic judgement we have to turn to an examination of the operation of the evaluative rule of the pedagogic device, which is discussed in detail in the following Chapter. The regulative discourse is the general mechanism for the normalising of the distribution of social goods, including the distribution of forms of knowledge and consciousness. However, the actual realisation of distribution—that is, of the regulation of consciousness as an effect of selection, pacing and sequencing of content—is ultimately the work of the evaluative rule.

Chapter 4

The evaluative rule and the structuring of pedagogic judgement

4.1 Introduction

In Chapter 3 we located the point at which attention to the problematic of pleasure might be reinserted into Bernsteinian theory. We found that pleasure is ultimately bound up with the moral order, the theoretical marker of which is the regulative discourse of pedagogic discourse, situated at the level of the recontextualising rule. The regulative discourse, with reference to the content of the distributive rule, supplies the moral coordinates for the particular distribution of social goods (forms of knowledge and consciousness in this instance). However, within the theory of the pedagogic device we find that the actual work of the distribution of social goods is effected by the evaluative rule operating at the level of transmission and acquisition within the context of pedagogic practice. In Chapter 3 we argued that pedagogic judgement splits the productions of the pedagogic subject into that which is enunciated and the place from which the enunciation is made, the latter presumed to be the locus of the *jouissance* of the pedagogic subject and the target of the regulative discourse. Therefore, an attempt to map out the specifics of the operation of pleasure in pedagogic discourse, both empirically and theoretically, must start from an examination of the operation of the evaluative rule. Such a strategy is in line with Bernstein's understanding of the evaluative rule. In his discussion of the pedagogic device Bernstein arrives at the conclusion that evaluation is the key to pedagogic practice (1996: 50). He uses the term *evaluation* rather than *assessment* and is referring to teacher-student interactions as well as questions, problems, tests, projects, examinations and so forth. It is in this broader and more fundamental sense that we use the term here. For Bernstein, pedagogic practice is heavily saturated with evaluative acts that are continually being performed by both teacher and students. Following Bernstein, we are forced to conclude that every pedagogic modality is obliged to insert evaluative judgements on the pedagogic subject's knowledge claims into pedagogic practice if it is to function as pedagogy.

The question, then, is: how does evaluative judgement operate in pedagogy? A search for an answer to this question within Bernstein finds only the very general description of the educational codes of pedagogic modalities, stated in terms of the values of classification and framing. If it is the case that the evaluative rule condenses the whole of the pedagogic device, then it follows that we must be able to recover the contents of both the recontextualising rule and the distributive rule from the operation of evaluative judgement. However, when we examine the theory we fail to find any detailed account of the workings of evaluative judgement. While the proposition asserting that the whole of the device is condensed in the evaluative rule does tell us that evaluative judgement must be structured by the contents of the recontextualising rule and the distributive rule, the former in the service of the latter, it reveals little of how such structuring actually works; that is something left in each case as a matter for empirical investigation. This state of the theory on the workings of the evaluative rule is unsatisfactory. Is it not possible to construct a more general account of the operation of evaluative judgement? We find it helpful to approach this question by recruiting Hegel's general theory of judgement as expounded in his *Science of Logic*. Since we are concerned with evaluative judgement in the context of pedagogy, we shall refer to it as *pedagogic judgement* from this point on.

A possible objection to the use of the term *pedagogic judgement* might be that the evaluative rule is realised in the production and properties of the texts by the student and that judgement of the student's text is really a teacher performative. That is true in one sense. However, without the acquisition of recognition and realisation rules for the production of legitimate texts the student would fail to produce the required text. Further, recognition and realisation rules are nothing other than elements of the operation of pedagogic judgement, which are used by the student even as they are acquired and elaborated on through pedagogic action. In other words, when the student is confronted with a pedagogic demand, that demand has to be treated as transmitting information about the requisite recognition and realisation rules and hence about the way in which pedagogic judgement is to operate. From this it follows that texts that confront the student with demands to solve mathematics problems also transmit information about the workings of pedagogic judgement. A few more clarifications need to be made before we move on to our discussion of Hegel.

At the conclusion of Chapter 1 we emphasised that structure is treated as distinct from specific empirical content and that structure is conceived of as organising/formatting the empirical. The evaluative rule is therefore conceived of as structuring pedagogic action to produce specific pedagogic codes and modalities but also as having its specific content structured by specific pedagogic codes and modalities derived from the recontextualising rule (cf. Bernstein, 1996: 51).

In this Chapter we focus almost entirely on instructional discourse—a move which might be greeted with some surprise since the discussion has been firmly focussed on the regulative up to this point. Salecl (1994), drawing on Elster (1983), persuasively argues that the relation between the regulative and the instructional *within actual pedagogic practice* is such that the former is essentially a by-product of the latter, by which she means: (1) that the moral discourse emerging in a pedagogic context arises out of the organisation and elaboration of the instructional contents, and (2) that the moral discourse cannot be productively transmitted in a direct manner, for to do so produces the moral as instructional content to which comes to be attached a moral discourse different from that intended through direct instruction. Again, Bernstein's (1996) proposition stating that the whole of the pedagogic device is condensed in evaluation tells us that the organisation and elaboration of instructional is structured by the evaluative rule which is derived from the recontextualising rule in the service of the distributive rule. For Bernstein (Op.cit.) the evaluative rule, of course, resides at the level of pedagogic practice, which is always intent on the transmission and acquisition of specific instructional contents. Therefore, at the level of pedagogic practice, which cannot function without the operation of pedagogic judgement, we are obliged to attend to the structuring of the elaboration of the instructional contents if we are to grasp the workings of the regulative. In Chapters 5 and 6 we will show in detail how the regulative is attached to the instructional.

4.2 Hegelian judgement

Using Hegel, we produce an analysis of a series of tasks found in one of the texts we analyse extensively in this project, a grade four mathematics text of the *Mathematics at work* series (Murray, Human & Olivier, 1997) to exemplify significant features of the theory and to demonstrate (1) how Hegel's theory might be employed to produce an account of the operation of pedagogic judgement, (2) how a pedagogic text, intended to support teaching and learning, deploys pedagogic judgement, and (3) more specifically, how a pedagogic text supporting a competence pedagogy deploys pedagogic judgement. First, we present a very brief and greatly simplified sketch of key elements of the Hegelian theory of judgement to orient the reader.

For Hegel the operation of judgement splits the notion (idea or concept, if you like) into a subject and one or more predicates that serve to fill out the notion. The four moments of the judgement in Hegel's theory are the judgements of *existence*, of *reflection*, of *necessity* and of the *notion*.

4.2.1 The judgement of existence

The initial encounter with a notion is one of *immediacy*; it is simply a "that," an empty signifier: a verbal or written mark, or gesture. The relations between the specific notion and other notions are not yet established, so that what we might call the "understanding" of the notion is not yet apparent because of the absence of predication; or, more accurately, of the absence of appropriate predication. In other words, to demonstrate that we "understand" a notion we must display a series of predicates different from the signifier for the notion itself. For example, when we ask a student a question like "What is a square?" we do not accept the response: "A square is a square." Such tautological responses fail to present an adequate predication of the term *square*. In its immediacy, the notion is marked by impossibility because of the absence of adequate predication.

4.2.2 The judgement of reflection

The impossibility of the notion at the level of immediacy generates the moment of reflection, in which an attempt is made to predicate the notion, to transform it from a mere "that" into something more discursively substantial. For example, an examination of the features of a square begins to suggest how we might define it. The attempt at predication opens up a space of *possibility* in which an increasingly comprehensible correspondence between subject and predicate(s) is generated.

4.2.3 The judgement of necessity

At some point, however, the work of predication must be halted, and it is this arresting of continued predication that shifts the judgement from reflection into necessity. The particular features of a square that enable us to distinguish between it and other plane figures, from, say, a rectangle, are essential to our definition of the square. Now a *necessary* relation between subject and predicate(s) is established, and the notion is no longer a mere "that."

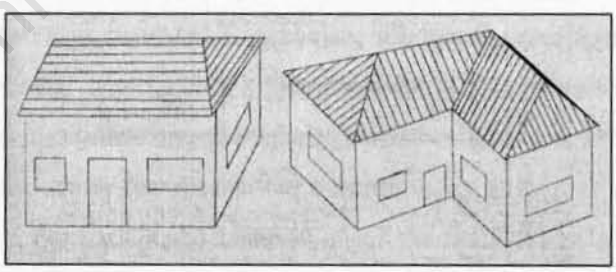
4.2.4 The judgement of the notion

The movement of the judgement from immediacy to necessity is itself dependent on the generation of coherence from the chaos of contingently occurring events and phenomena. In other words, the arrival at the moment of necessity is generated from within—and dependent on—*contingency*. With the judgement of the notion we are evaluating the extent to which some or other phenomenon corresponds to its notion. Given Hegel's apparent proclivity for triadic structures, this fourth moment of judgement is curious on a first encounter. We will discuss later why the triad of existence-reflection-necessity is insufficient and why the theory of judgement necessarily acquires a fourth moment.

4.3 Pedagogic judgement at work in *Mathematics at work*

The Grade 4 student text in the *Mathematics at work* series is organised as a sequence of Modules which are each made up of a sequence of Units. A Unit, typically, consists of a simple narrative that refers to some (often non-mathematical) context and a number of tasks related to that context. For example, Unit 1, Module 1 in *Mathematics at work 4* opens with a narrative about a family about to move house:

Mr and Mrs Nhlapo and their four children used to live in quite a small house. Now they are very excited. They will soon move to a new, bigger house.



Vusi, the elder son, goes to look at the new house. He promises his sister Felicity and his two younger brothers, Duma and William, that he will measure the new house so that he can tell them how big it is. While Vusi is away, Felicity will measure their present house so that they can compare houses when he returns.

Vusi and Felicity have no measuring tapes, so they decide to measure with their forearms […]. (Unit 1, Module 1, *Mathematics at work 4*: 3; picture showing forearms omitted)

Little explicit exposition of mathematics is to found in the texts. The reader, guided by the narrative and tasks, is expected to elaborate and make explicit the intended mathematics contents. The narrative establishes the non-mathematical context for activity and implicitly announces the central mathematical topic (measurement, in this instance). In the teacher's guide to *Mathematics at work 4* the authors state that *area* and *perimeter* are the "key concepts" to be elaborated, but given that those contents are developed through a focus on measurement, we are justified in arguing that they can be considered as species of measurement in the Module.

The key concepts addressed in this module are area and perimeter and the need for standardised units of measurement. […] The problem of comparing the sizes of two houses without any modern measuring instruments is used to provide learners with an experience of the importance of measurement […], measuring with primitive units, the problems that are encountered when measuring units are not standardised […]. (*Mathematics at work 4 Teacher's Guide*: 21)

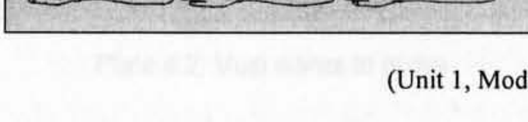
The reader is confronted with some or other—usually non-mathematical—conundrum that is to be dissolved through the development of procedures that can be read as realisations of the mathematics enabling the solution of the problem. The central notions are developed as *necessary* by way of the production and subsequent resolution of an ambiguity resulting from the use of everyday, non-mathematical procedures and terms. In Module 1 of *Mathematics at work 4* the ambiguity is produced by exploiting the expected anatomical differences between students—the lengths of their forearms—as well as the imprecision of the everyday use of the notion of *size* when comparing two houses.

Some careful analysis is now needed to show in detail the movement from the immediacy of an imagined non-mathematical context to the production of generalisable mathematical notions as necessary. To simplify the ensuing discussion of the textual mechanisms at work we will, for now, restrict our analysis to the attempted elaboration of the notion of *measurement*. We will proceed by examining the movement of the narrative and the tasks the reader is expected to complete. The narrative is comprised of both pictorial and alphanumeric text, and both textual types will be referenced in our discussion.

4.3.1 The judgement of existence

The narrative posits the existence of the notion of measurement in the form of a written description (see above) and an accompanying picture that isolates and apparently emphasises significant features of linear measurement: the selection of a unit and its repetition as well as linear concatenation producing an aggregation that can be counted to produce a number that represents extent.

Vusi and Felicity have no measuring tapes, so they decide to measure with their forearms, as shown below:



(Unit 1, Module 1, *Mathematics at work 4*: 3)

However, what we must recognise is that, at this stage, the text is merely pointing at an imagined event and claiming, measurement is "that." The text does not explicitly announce a series of predicates that can serve as a further determination of the term *measure*. The reader is then required to emulate the activity of the textual characters so that the ambiguity that will be produced in the text is redoubled in the activity of the reader:

Measure one of these things with your own forearm:
- the length of your classroom
- the width of your classroom
- the length of your teacher's table
- something else that your teacher indicates

Write down the result in your workbook.

(Task 1, Unit 1, Module 1, *Mathematics at work 4*: 4)

Here, as was pointed out earlier, the expectation is that different readers, by using their forearms to measure the same object, will produce different numerical descriptions of the objects—a foregrounding of heterogeneity. The reader is expected to note that the measured object remains invariant while the results of measuring vary. In its immediate realisation, measurement is then to be recognised as unstable across readers: while individual measurement may be sensible for every single reader, it is meaningless (unintelligible) across readers as long as it remains at the level of the immediate. The authors are, of course, gambling that the reader will recognise and accept that the object is not altered by the act of measuring it. Strictly speaking, the task does not exclude the measurements produced by different readers from being the "correct" measure; it merely states that, in their immediacy, they are not equivalent. Nevertheless, the suspicion of the non-validity of the measurements of a single object by multiple readers is now extended to the measurement of objects in general: the reader is required to eventually arrive at the conclusion that even though everyone has measured, a universal notion of measure has not yet being realised.. The authors attempt to draw the reader towards the latter conclusion by focussing on a comparison of the measures of different objects, produced by different textual characters:

Vusi returns from his visit to the new house. He says that it is 42 forearms long and 28 forearms wide. But he also made some other measurements which he finds difficult to explain, so he makes [a] drawing to show what he means [Plate 4.1a] [.] To make it easier to compare the two houses, Felicity also makes a drawing of their present house and shows her measurements on the drawing [Plate 4.1b] [.] Now everybody in the family is very disappointed. When they listen to Vusi and Felicity, it seems that the new house may not be bigger than the old house. So they think that maybe they should stay in the old house. (Unit 1, Module 1, *Mathematics at work 4*: 4-5)

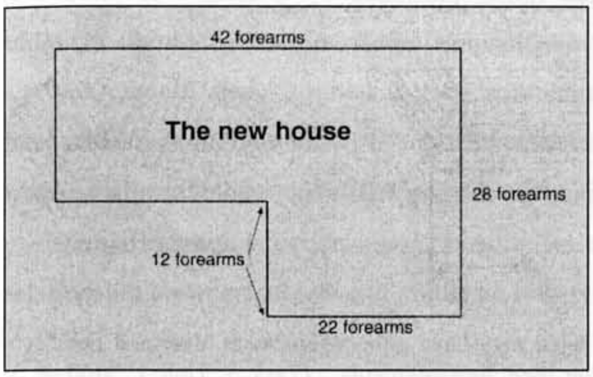


Plate 4.1a: Unit 1, Module 1, *Mathematics at work 4*: 5

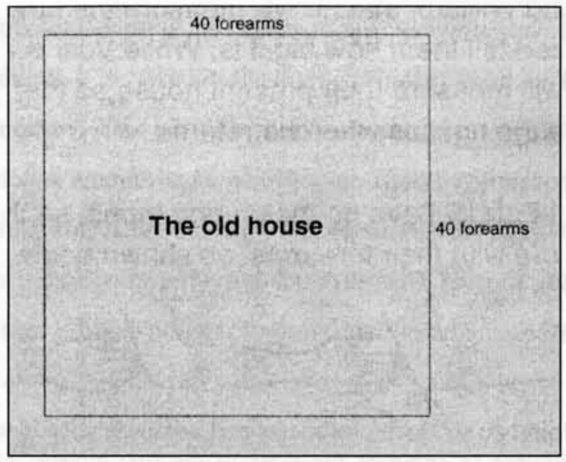


Plate 4.1b: Unit 1, Module 1, *Mathematics at work 4*: 5

Note that the textual characters, Vusi and Felicity, have measured different objects: the "new" and "old" houses, respectively, so that we have a realisation of (2). The term, *forearms*, incorporated into the diagrams (Plates 4.1a and 4.1b) is a problematic attempt at specialisation. What follows is a strong insistence by one of the textual characters, Vusi, suggesting that the measurements are not valid (see Plate 4.2). Vusi's appeal to his family is followed by a second task for the reader that transforms the suggestion of non-validity into fact:

Think about what may have gone wrong with Vusi and Felicity's attempt to compare the sizes of the two houses with their measurements. [...] (Task 2, Unit 1, Module 1, *Mathematics at work 4*: 5; italics added)

The italicised text implicitly informs the reader that the difference between the measurements is produced by the individual acts of measuring, and it marks that difference as an index of the occurrence of an error.

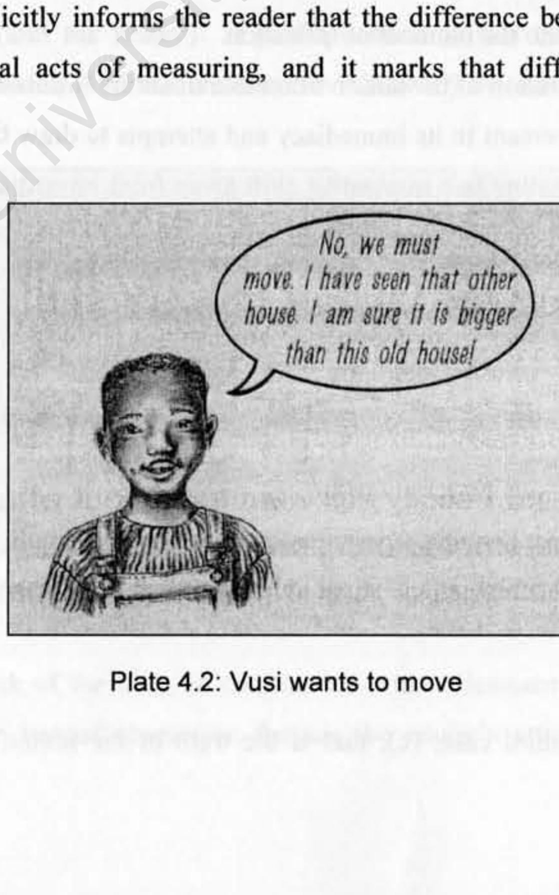


Plate 4.2: Vusi wants to move

In other words, the comparison, is to be substituted with a conclusion that neither measure is valid. The conclusion, if realised, is not a deduction but rather produced by a sleight of hand that foregrounds one possibility as the only reasonable conclusion: neither measure is valid. Another possibility is that one of the measurements is "correct."

The insistence on the "incorrectness" of the measurement produced by the textual characters (and so, too, of that produced by the reader) is sustained by having different readers compare their assessments of the nature of the non-validity of the measurements produced by the textual characters:

Join two or three classmates and compare your ideas of what may have gone wrong with Vusi and Felicity's attempt to compare the sizes of the two houses, by using their measurements. (Task 3, Unit 1, Module 1, *Mathematics at work 4*: 5)

Now, since the reader has emulated the activity of the textual characters, an identity is set up between the former and the latter. The comparison of the measurements produced by the textual characters cannot be reconciled at the level of the immediate (so, too, for the readers), suggesting that to remain at the level of the immediate has the potential to produce error. In this way, the activity of the reader is identified with the suggested error through identification with the textual characters. Measurements produced by the textual characters and the reader(s) are, for all intents and purposes, of the same type. If Vusi and Felicity are "wrong," then so is the reader. The reader has now been brought to the limit of the notion of measurement in its immediacy.

At this point a qualitative shift in the judgement of the existence of the notion must occur if the differences between measurements are to be reconciled. Once this shift has occurred, as indexed in any attempt to reconcile the series of measurements, the reader is no longer at the moment of immediacy but has drifted into the moment of reflection.

To summarise: the elaboration of the notion of measurement in *Mathematics at work 4* starts from a consideration of the measurement in its immediacy and attempts to draw the student into arriving at a chain of conclusions culminating in a qualitative shift away from immediacy and into reflection. The senselessness (impossibility) of measurement in its immediacy can be realised in three ways:

(a) measurement *is not* X (i.e., any other phenomenon); this is true but says nothing positive about the nature of measurement;
(b) measurement is measurement; this is also true but tautological, not providing us with a further determination that can explain measurement;
(c) measurement *is* X (i.e., some other phenomenon); this is apparently false because it establishes an identity between measurement and something other than itself rather than generating a series of predicates.

It is, interestingly, the third case, (c), that is the truth of the notion in its immediacy: the text generated an identity of the failed activity of the textual characters (and so, too, of the reader(s)) with measurement, so that what we encounter is an identity which is simultaneously a discrepancy (a non-identity)! In other words, what has been generated is a *speculative identity*.

What should also be noted in this Section is that the existence of the notion (measurement) is posited as a positive content; the task of the reader has been to generate a series of predicates that would "fill out" the subject (measurement). That is, the movement has been on the side of the predicate. What the reader discovers with the existence of the notion in its immediacy is that the relationship between subject and predicate is impossible.

4.3.2 The judgement of reflection

The next Unit is titled "Vusi and Felicity think again," indicating an emphasis on the moment of reflection. The reader is told that Vusi and Felicity are still contemplating "what went wrong." The reader's attention is drawn to the term *forearms* once again by being required to perform a calculation:

Felicity asks Vusi whether he has measured the other two outside walls, marked with question marks on the sketch. Vusi has not measured these walls. Can you find out how long these walls [refer to Plate 4.1a] are by using the measurements that Vusi has made?

And, finally, the problematic status of *forearms* (and so, too, of the measurements) is explicitly declared by Felicity (Plate 4.3). With the declaration of the cause of the discrepancy the text arrives at the conclusion that the different forearm lengths mean that different measures are produced.

What the text now emphasises is the utterly contingent nature of that which has been used to fill out the notion of measurement to this point: content disrupts form, and content is derived from the bodies of the textual characters (and the reader). The implication is that the corporeal element of the procedure has to be evacuated so that measurement can coherently be realised.

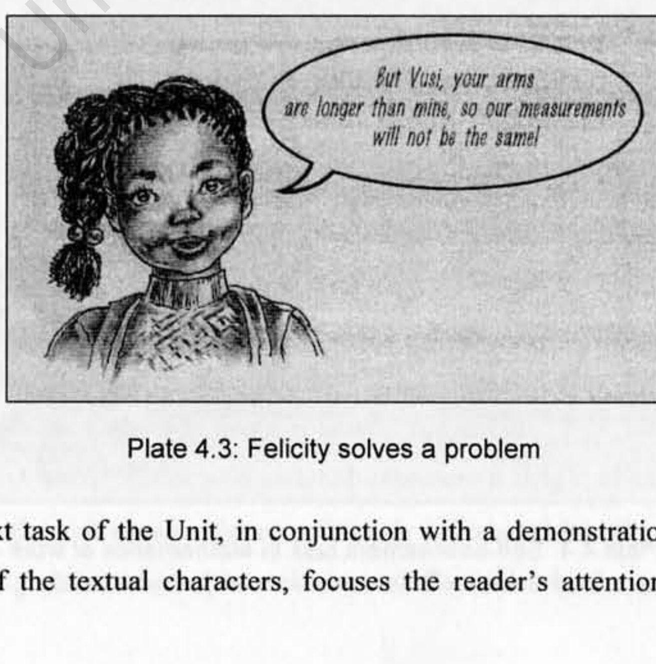
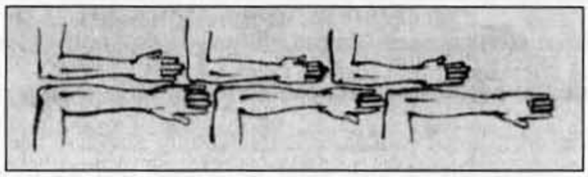


Plate 4.3: Felicity solves a problem

To this end the next task of the Unit, in conjunction with a demonstration of comparison of the lengths of the arms of the textual characters, focuses the reader's attention on measurement as a description of one length in terms of another:

What do you think Felicity and Vusi should do to improve the way they compared the sizes of the two houses? Discuss this with two or three classmates.

Felicity and Vusi compare their armlengths as shown below:



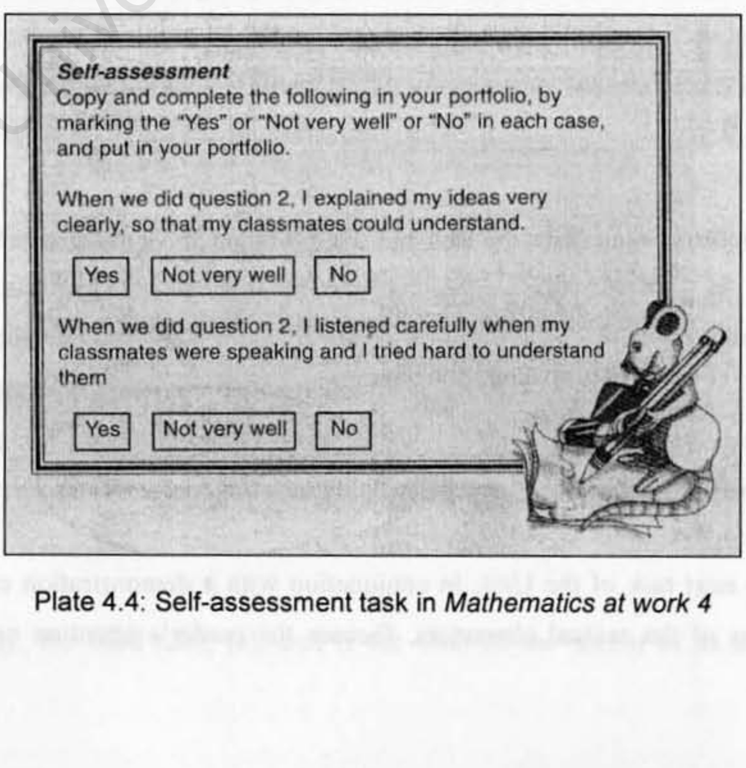
(Task 2, Unit 2, Module 1, *Mathematics at work*: 7)

The importance of Task 2 is emphasised by the inclusion of a "self-assessment" task that appears after Tasks 3 and 4 (see Plate 4.4).

The next two tasks reinforce the idea of a proportional relation between the lengths of forearms (and so, too, the measurements) by asking the reader to, apparently, perform impossible calculations. The phrasing of the questions—"what will s/he find for each of the … walls"—is deliberately under-specified with respect to the solution-type demanded, leaving space for an attempt to generate quantities, but there is not sufficient information supplied to perform the calculations.

If Felicity measures the outside walls of the new house with her own arms, what will she find for each of the 6 walls? (Task 3, Unit 2, Module 1, *Mathematics at work 4*: 7)

If Vusi measures the outside walls of the old house with *his* arms, what will he find for each of the 4 walls? (Task 4, Unit 2, Module 1, *Mathematics at work 4*: 7; italics in the original)



Self-assessment

Copy and complete the following in your portfolio, by marking the "Yes" or "Not very well" or "No" in each case, and put in your portfolio.

When we did question 2, I explained my ideas very clearly, so that my classmates could understand.

Yes | Not very well | No

When we did question 2, I listened carefully when my classmates were speaking and I tried hard to understand them

Yes | Not very well | No

Plate 4.4: Self-assessment task in *Mathematics at work 4*

It is the impossibility of the calculations that is meant to foreground the only rational solution; namely, a solution that recognises one measurement as some proportion of the other, which is nothing more than establishing that one measurement can be described in terms of the other. Once the reader has realised that judgement, the necessity for a *unit of measurement* begins to become apparent.

Figure 4.2 presents a summary of the chain of conclusions produced by reflection. The chain also shows that, with the judgement of reflection, the correspondence between subject and predicate has become increasingly comprehensible.

4.3.3 The judgement of necessity

The judgement of reflection takes the reader to the point of the realisation that measurement is sensible if ... If what? If it is generated by way of a comparison of some length against another that is recognised as *the* standard length, namely, against that which acts as a unit of measurement. In other words, for measurement to arrive at its notion, the reader has to arrive at the position in which the relationship between subject and predicate is conceived of as *necessary*. In this context the existence of the act of measuring implies the necessary existence of a unit of measurement; and also, the existence of a unit (of measurement) implies the existence of measurement because a length becomes a unit only in the context of measurement.

The consideration of measurement in terms of length, while allowing the reader to recognise the necessity of an explicit positing of a unit *length*, is not sufficiently general yet. The idea of measurement itself as of different types needs to be realised. So, even though the textual characters have apparently arrived at the necessary relation between measurement and a unit with respect to length, they are unable to solve the problem of which house is the bigger because length in-itself appears not to enjoy the descriptive power to adequately capture the sizes of the houses—the problem remains insistent:

Vusi, Felicity and their mother visit the new house to take another look. They are very impressed with the tiled floors. [...] Mrs. Nhlapo likes the tiles, but she is worried about the size of the new house. From the inside it looks smaller than their old house, but she is not sure. (Unit 3, Module 1, *Mathematics at work 4*: 8)

The next step is for the reader to recognise that in addition to the necessity of a unit for measurement, the unit itself must partake of the *quality* of the measurement. This realisation is implied in the apparently serendipitous occurrence of floor tiles in the new house and Felicity's reaction to their presence (see Plate 4.5).

In the Task that follows (Task 1, Unit 3, Module 1, *Mathematics at work 4*) the reader is asked to compare the sizes of the two houses by using Felicity's suggestion. Two diagrams of the houses are supplied (Plates 4.6a and 4.6b). Plates 4.6a and 4.6b represent a sleight of hand by means of which a *two-dimensional* unit—the unit square—is surreptitiously introduced into the narrative in the guise of a contingently occurring phenomenon (the existence of floor tiles in the new house). The rest of

Module 1, Unit 3 marks the difference between two types of measurement: *perimeter* and *area*, and Module 1, Unit 4 deploys those types in different non-mathematical "contexts", but we will leave aside discussion of the further registration of mathematical terms and procedures in Module 1 for now.

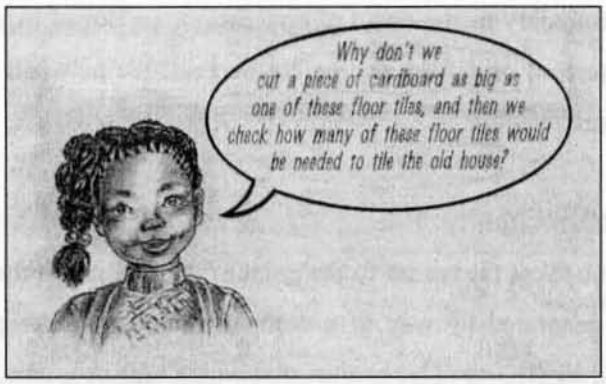


Plate 4.5: Unit 3, Module 1, *Mathematics at work*: 8

The further development of the notion in the direction of the explicit recognition of qualitatively different types of measurement happens later, in Module 9 (see *Mathematics at work 4*: 173-95), where it becomes clearer that the dimension of the space to be measured demands a unit of the same dimension; in Module 1 this requirement is still largely implicit.

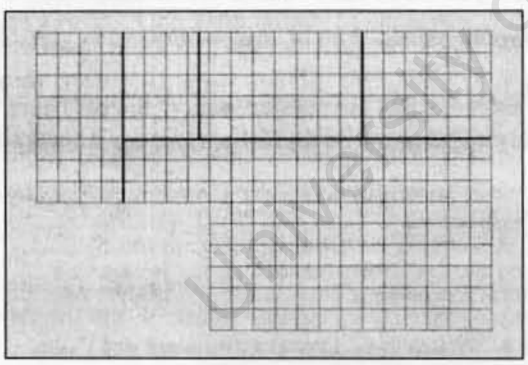


Plate 4.6a: Module 1,Unit 3, *Mathematics at work 4*:: 8

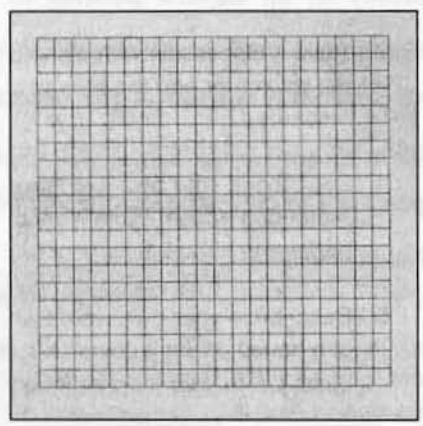


Plate 4.6b: Module 1, Unit 3, *Mathematics at work 4:* 9

4.3.4 The judgement of the notion

When we refer to *evaluation* what is it that we mean? It is a judgement of the object under scrutiny in terms of its notion. Here the predicate is a description of the relationship of the object to its notion. In other words, the judgement is now concerned not with the filling out of the notion, but rather the adequacy of the object itself. Is the object "good" or "bad", "elegant" or "clumsy" … ?

In *Mathematics at work 4* the reader is required to perform such judgements in Module 9, which is titled "Measurement." Recall that the early work on measurement is presented in Module 1, titled

"Comparing houses." Retrospectively, from the vantage point of Module 9 in which the topic is clearly named, "Comparing houses" indicates that the reader was not yet in the presence of the notion, that the notion of *measurement* was still "in its becoming" at that stage.

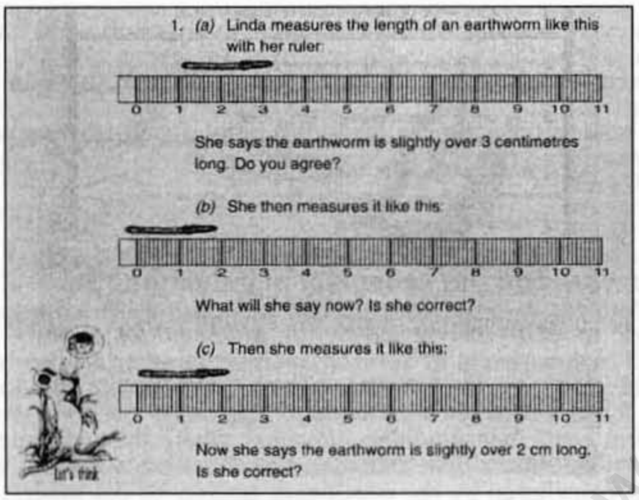


Plate 4.7: Task 1, Unit 1, Module 9, *Mathematics at work 4*: 174

Consider Task 1, Unit 1, Module 9, *Mathematics at work 4* (see Plate 4.7). We encounter Linda measuring the length of an earthworm and the reader is asked to assess and comment on a series of attempts at measurement by the textual character. While some readers might be tempted to read Task 1 of Module 9 as merely a practice exercise on the use of a ruler for (linear) measurement, the demand for an interrogation of various attempts at measuring is intended to encourage in the reader a more explicit reference to the notion of (linear) measurement than would be the case with practice exercises: does the procedure Linda uses make sense in terms of the notion of measurement?

> This activity strives specifically to draw learners' attention to incorrect measuring procedures. Even learners in the senior grades and adults sometimes make measuring mistakes if they are not made aware of them. (*Mathematics at work 4, Teacher's Guide*: 82)

We should not fail to notice in addition that the realisation of the notion is evidenced in the rehearsal of a procedure. In other words, the actuality of the notion depends on the occurrence of an event that is itself irreducibly contingent. Contingency comes to feature in both production and realisation (reproduction) of the notion. First, with respect to its production, the notion, in its arrival, retroactively transcodes a series of contingent events into its necessary conditions: the initial activity of the reader and textual characters are necessary for the generation of predicates that fill out the notion. Second, every realisation (reproduction) of the notion only comes to be by way of a contingent event that is its index. The existence of a notion is therefore achieved only by way of conferring necessity on contingent events.

The relation between contingency and necessity can also be formulated in terms of the idea of a *gap*—that is, the now commonplace idea that there is always a gap between an object (or event) and its notion. The gap is strictly correlative to the pedagogic subject (i.e., the student/reader). In other words, the reader (pedagogic subject) is the breach between the object and its notion, in both senses of the word. The judgement of the notion is necessitated by the contingency of the activity of the reader (pedagogic subject)—the very activity which was retroactively transcoded into a necessary condition. *This* is why the judgement acquires an additional, fourth moment, beyond the triad of *immediacy-reflection-necessity*: the reader (pedagogic subject) is a point of self-relating negativity[16] disturbing the smooth operation of mathematics.

4.4 *Mathematics at work* and the syllogism of induction

Apparently the pedagogic modality privileged by the *Mathematics at work* series is inductive. The structuring matrix of the narrative (and tasks)—which replaces the previous use of exposition in textbooks—is of the form particular–singular–universal where the particular is given as a narrated event and the singular is constituted by the contingent activity of the reader. That is, the readers are confronted with some particular situation from which a problem emerges and in response to which a series consisting of singular reader reactions is produced to mediate between the particular and the universal (notion). The narrative and series of tasks represent an attempt at effecting a shift from the particular to the universal by establishing a pair of links of the form: particular-singular/singular-universal. Hegel (1969: 690) describes induction as "the syllogism of *experience*—of the subjective taking together of the individuals into the genus and of the conjoining of the genus with a universal determinateness because this latter is found in all the individuals" (italics in the original), which he represents diagrammatically as follows:

$$\begin{matrix} i \\ i \\ U - \; - P \\ i \\ i \\ \textit{ad} \\ \textit{infinitum} \end{matrix}$$

(ibid.)

Hegel does, however, warn of the problems of proceeding inductively as he sets about describing the central features of induction, from which we can recognise that mathematics as we know it could not have been generated inductively. That is, mathematical systems would collapse if they were constructed solely on series of inductive conclusions that remain problematical.

[Induction] is [...] essentially a subjective syllogism. The middle terms are the individuals in their immediacy; the subjective taking together of them into the genus by means of allness is an *external* reflection. On account of the persistent *immediacy* of the individuals and their consequent *externality*, the universality is only

16 In Piagetian genetic epistemology, for example, the self-relating negativity of the subject is to be grasped in terms of the conceptual pair, *egocentrism* and *sociocentrism*, the two principle modes of disruption of rational thought.

completeness, or rather remains *a problem*. In induction, therefore, the *progress* into the spurious infinite once more makes its appearance; *individuality* is supposed to be posited as *identical* with *universality*, but since the *individuals* are no less posited as *immediate*, that unity remains only a perennial *ought-to-be*; it is a unity of *likeness*; those which are supposed to be identical are, at the same time, supposed *not* to be so. It is only when the *a*, *b*, *c*, *d*, *e* are carried on to infinity that they constitute the genus and give the completed experience. The *conclusion* of induction thus remains *problematical*. (Hegel, 1969: 690-1; italics in the original)

Here we should note that the pedagogic modality privileged by the text under discussion is only apparently inductive. First, and obviously, the pedagogic modality has as its object the reproduction of mathematics, not the production of new mathematics. This is not to deny that the pedagogic subject experiences the reproduced mathematics as new. Second, the organisation of the pedagogic text is such that the tasks the pedagogic subject is confronted with already have encoded into them, in a condensed form, the conceptual work that went into the production of the mathematics contents. That is, the tasks are always-already structured from the position of knowledge of the content which is to be acquired. Third, it follows that the aforementioned structuring of the tasks provides the an implicit guarantee that the finally arrived at contents will indeed be legitimate mathematics contents. In other words, an elaborate game is being played in which the pedagogic subject agrees to proceed as though s/he is a producer of mathematics knowledge who employs inductive reasoning, while the mathematical truth of the results of such activity are guaranteed in advance of their production. As Hegel points out, for induction to apparently operate as a reliable syllogism, it must be based on an immediacy which is always-already the universal immediacy:

[Induction], in expressing that perception in order to become experience *ought* to be carried on to *infinity*, presupposes that the genus is *in and for itself* united with its determinateness. Therefore, strictly speaking, it rather presupposes its conclusion as something immediate [...]. An experience that rests on induction is accepted as valid *although* the perception is admittedly *incomplete*; but the assumption that no *contradictory instance* of that experience can arise is only possible if the experience is true *in and for itself*. Thus the syllogism by induction, though indeed based on an immediacy, is not based on that immediacy on which it is supposed to be based, on the *merely affirmative* [*seiende*] immediacy of *individuality*, but on the immediacy which is *in and for itself*, the *universal* immediacy. (Hegel, 1969: 691; italics in the original)

It follows that the "inductive" pedagogy exhibited here is really a form of quasi-induction, two potential outcomes of which may well be that the pedagogic subject arrives at an incorrect understanding of induction *and* also an incorrect understanding of mathematical deduction, believing the latter to be what is really induction proper. We can find in Hegel himself the clue as to why a spurious form of induction comes to serve as a structuring resource for the organisation of contents within this pedagogic modality:

The fundamental character of induction is that it is a syllogism; if individuality is taken as the essential, but universality as only the external, determination of the middle term, then the middle term would fall asunder into two unconnected parts and we should not have a syllogism; this externality belongs rather to the extremes. It is only as *immediately identical* with *universality* that *individuality* can be the middle term; such universality is properly *objective* universality, the *genus*. This may also be looked at in this way: universality is *external but essential* in the determination of individuality that forms the basis of the middle term of induction; but such an *external* is no less immediately its opposite, the *internal*. The truth of the syllogism of induction is, therefore, a syllogism that has for its middle term an individuality that is immediately *in its own self* universality [...] (Hegel, 1969: 691-2; italics in the original)

First, this quasi-induction has the *form* of a syllogism: it is as though the pedagogic subject is actually always *reasoning* mathematically (deductively). Further, the contingent productions of the pedagogic subject, which make up the individual of the inductive matrix universal – individual – particular, are posited as "immediately in its own self universality." This last characteristic is vital for the preservation of the illusion that the activity of pedagogic subject is already mathematical and that s/he is therefore producing mathematics independently. In addition, the structure of this pedagogic modality can, despite its apparent celebration of so-called "relevance," even be read as a move *against* the prioritising of the everyday at the level of mathematics contents: first, the pedagogic subject starts their quasi-inductive journey by encountering some or other particular "relevant" situation/problem; next, the singular activity of the pedagogic subject serves to effect the negation of strategies obtaining in the "relevant" situation. This first negation is followed by a second negation: the negation of the singular activity of the pedagogic subject, when taken together with a series of other singulars, to ultimately produce a universal notion. Here we have a perfect example of how it is that we should understand Hegel's notorious "negation of the negation": the second negation does not return us to the original state of things presented but rather to that which was itself negated in the very presentation of the original situation/problem: namely, the universal nature of mathematics. In other words, mathematics is recovered from the original, apparently extra-mathematical situation/problem by way of a series of negations that incorporates a negation of the singular and contingent (oftentimes idiosyncratic) activity of the pedagogic subject. It is pedagogic judgement, hence evaluation, that is the locus of the series of negations that effects the reproduction of school mathematical knowledge. With respect to "relevance" and the singular activity of the student, pedagogic judgement is therefore negative. The strategy fails when it is conceived of as true induction: the often uncritical affirmation—whether explicitly or in silence—of the enunciations of students in deference to a crude understanding of inductive teaching/learning (encouraged by official pedagogic discourse and its avatars in teacher education), ultimately serves to negate pedagogic judgement as well as mathematics.

4.5 Evaluation and the notion in its immediacy

In Section 4.3 we demonstrated in some detail how Hegel's theory of judgement might be employed to describe features of the way in which pedagogic judgement attempts to specialise consciousness. All evaluative events must start at some place, metaphorically speaking, at which the notion is posited in its immediacy. The initial, immediate, positing of the notion presupposes the potential for starting the work of predication. But how can we start the work of predication if we do not yet know the notion in its necessity? Initially all we can do is identify the notion in its immediacy with *something other than itself* because, as we have seen earlier, identifying the notion with itself produces nothing but impossibility; that is, a tautology. In other words, to begin to move beyond the impossibility of the notion in its immediacy we are forced to construct *an identity which is simultaneously a non-identity*—this is what Hegel refers to as a *speculative identity*. In this way the missing representation that would index the notion in its necessity is, at the moment of immediacy, *represented by something other than itself*. This representation of the missing representation is nothing other than that which is already known but not yet that which is to be known *qua* notion in its necessity.

Now, what does the work of predication—that is to arrive at the notion in its necessity—achieve with respect to the representation of the missing representation? The notion in its necessity, which recovers the representation that was missing at the moment of immediacy, is a *negation* of the representation of the missing representation. For example, when a teacher uses the strategy of introducing students to the notion of an equation by appealing to the notion of a beam balance in a state of equilibrium, the idea is not that the students will now move into a study of the beam balance but rather that, once they have arrived at the notion of an equation, the notion of a beam balance can be dispensed with. The moments of the judgements of reflection and necessity effectively negate the notion of the beam balance. The metaphorical statement, "an equation is a balance" is, strictly speaking, a speculative identity. The balance in equilibrium is the representation of the missing representation (the adequate predication of the notion of an equation; the notion in its necessity). It follows, then, that the notion is "present" in the form of a paradoxical object at the moment of immediacy: structurally, it is "present" as the missing representation *and*, speculatively, as the representation of the missing representation. We can render this structure diagrammatically as in Figure 4.1.

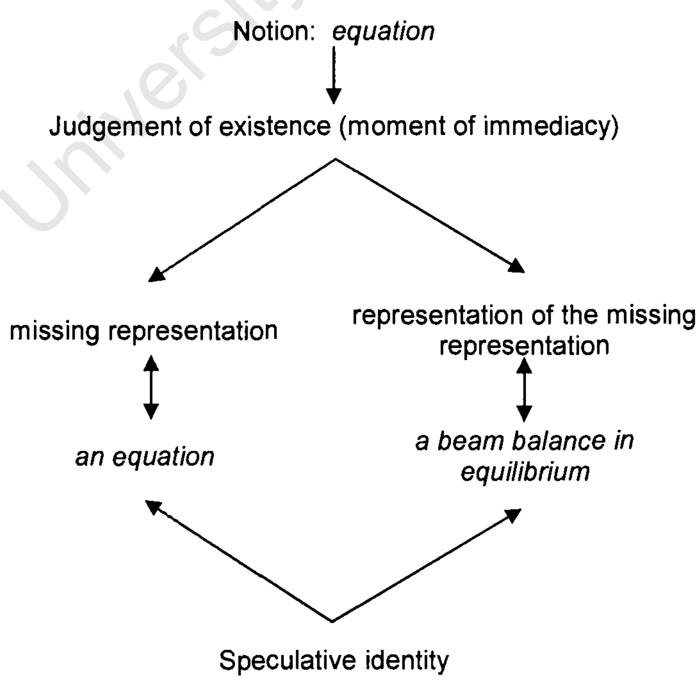


Figure 4.1: "An equation is a balance"

In order to emphasise what is at stake here, let us ask ourselves another question, even if the answer appears to be obvious: what, beyond the missing representation of the notion, does the representation of the missing representation stand for? Obviously for the lack of the notion *in the consciousness of the pedagogic subject*, but with an additional turn of the screw: given that the reproduction of mathematics can be registered only in empirically occurring texts, the pedagogic subject, through whom reproduction is to make itself known, functions as *both facilitator and obstacle to reproduction* since s/he is required to produce the necessary texts. What we have is a split between the missing representation and the representation of the missing representation that is redoubled at the level of the subject in the form of facilitator of reproduction (presence of the required text) and obstacle (absence of the required text). What an evaluative event does, in other words, is produce a split both at the level of the pedagogic text *and* a split internal to the pedagogic subject: prior to the arrival of the required text the status of the pedagogic subject as either facilitator or obstacle is undecidable, so that both positions are potentialities. The split is momentarily excised by the arrival at the notion in its necessity (or quasi-necessity, if the ground for establishing necessity is not mathematical), where the representation of the missing representation is finally negated and substituted by the representation that was missing at the moment of immediacy. The temporal movement of the notion from immediacy to necessity is of central importance in the specialisation of consciousness—without this movement, we remain at play in the sandpit, happily fondling our beam balances.

4.6 Summary: Propositions

In this study we take a series of results which, following Dowling (1993), we treat as propositions emerging from the discussion of antecedent work and which serve as the ground from which our descriptions and analyses are generated. There are three types of propositions listed here. The first is that of empirico-theoretical propositions that pertain to the historically-specific content of the pedagogic device; the second is that of theoretical propositions pertaining to pedagogic judgement. For the purposes of this work the theoretical and empirico-theoretical propositions should be distinguished from a third category of propositions that serve as research hypotheses. The latter are to be justified through an engagement with the empirical object of research.

4.6.1 Empirico-theoretical propositions on the pedagogic device (ETP)

The general structure which frames this investigation is that of the pedagogic device. We treat the pedagogic as a formal structure, the content of which is historically-situated. The propositions that are listed below are stated in terms of the historically-specific content of the three hierarchically related rules of the pedagogic device.

ETP 1: The distributive rule. The distribution of forms of knowledge and consciousness is currently structured by the principle demanding the weakening of boundaries, resulting in a general move towards the integration of knowledge across disciplinary boundaries, the weakening of the hierarchical relation between teacher and student, and the weakening of the boundary between everyday and academic knowledges.

ETP 2: The recontextualising rule. Pedagogic discourse recontextualises content in accordance with the imperative issuing from the distributive rule demanding the weakening of boundaries. That imperative is translated into the integration of knowledge to produce "learning areas" to replace disciplines at the level of curriculum, prescriptions for the restructuring of pedagogic practice along the lines of learner-centred pedagogy combined with elements of outcomes based education, and the presentation of knowledge contents as contextualised within the everyday. The particular structuring of regulative discourse supporting the new configuration of content at the level of the instructional discourse exhibits the features of contemporary utilitarianism in which the utility of knowledge is presented as coincident with the pleasure of the student.

ETP 3: The evaluative rule. The imperative demanding the dissolution of boundaries results in a pedagogic situation in which the criteria for the production of legitimate texts have to be transmitted and acquired in a manner that avoids the direct and explicit elaboration of contents by the teacher. The image of the student is that of a self-regulating autodidact who constructs their own knowledge under conditions of learner-centred facilitation.

4.6.2 Theoretical propositions on pedagogic judgement

The propositions indicate that which is to be taken as the theoretical specification of the notion of pedagogic judgement. However, here we will indicate the reasonableness of the propositions for our particular study by discussing aspects of our analysis and description of the empirical in relation to the propositions. To do so we are force to rely on work that is generated in the chapters concerned with the analysis of data, namely, Chapter 6, 7 and 8. The propositions elaborated here, derived as they are from antecedent theory, are to be understood as *general*, pertaining to pedagogic judgement within all pedagogic modalities rather than only the particular modality that is analysed in this work.

TP 1: In pedagogic contexts, including those under consideration here, *evaluation is the mechanism by means of which consciousness is specialised* in the transmission and acquisition of knowledge.

The particular pedagogic modality we examined in this work, named the "problem-centred approach" by its originators, claims (as implied by its name) that the student's mathematical engagement with "meaningful" problems is the motor driving the student's conceptual development as well as the reproduction of school mathematics. In this Chapter we demonstrated in detail how the *Mathematics at work 4* text attempts to drive the student towards arriving at the notion of measure through the posing of a sequence of problems that demonstrate to the student acts of apparently self-reflexive questioning by textual characters, intended to generate a field of predicates to fill out the notion. The demonstration of self-reflexive questioning through textual characters takes the place of the explicit transmission of mathematics contents in the pedagogy and is the carrier of evaluations of the activity of the student.

More generally, across the texts, a similar effect is generated by the careful sequencing of individual problems within larger Tasks and also across sequences of Tasks, which we demonstrated in Chapter 6 through a detailed analysis and discussion of two sequences of Tasks.

In Chapter 7, where we examine video records of actual classroom activity deemed to be exemplary instances of the pedagogic modality by its originators, it is demonstrated that the teacher took the position occupied by the textual characters in textbooks, posing series of self-reflexive questions intended to arrive at the envisaged mathematical specialisation. In the case of operation in the context of an elite private school we will see that the teacher policed the students' activity carefully and explicitly announced evaluations on their work as they proceeded.

A general strategy used in an attempt to specialise consciousness within the problem-centred pedagogic modality is described as a form of quasi-induction in this Chapter. The student is confronted with a particular, usually extra-mathematical, description of a problem situation to which s/he is required to respond in an (apparently) individual manner to produce a specific, singular response. The singular responses across students are then to be co-ordinated into a universal response of which each singular response is retroactively recognised as a specific instance. The attempt to co-ordinate the singular responses is intended to produce a moment of self-reflexive questioning that drives the student towards the universal. The form of induction is judged to be quasi-induction because the whole of the pedagogic activity is always-already structured from the position of the guarantee of the prior existence and consistency of the mathematics contents to be acquired. The latter serves as the actual ground for the evaluation of the validity of the student's text.

TP 2: The specialisation of consciousness requires the production of (i) resources enabling the *recognition* of utterances as elements of the particular specialisation under consideration, and (ii) resources enabling the *realisation* of specialised utterances within the specialisation. These are, respectively, termed *recognition* and *realisation rules*.

We demonstrate that the commentaries made available in the teacher's guides to the *Mathematics at work* texts make clear that the Tasks, Units and the individual problem that populate those, have to be recognised as presentations of specific mathematics contents by teachers and their students. In the discussion of the *Mathematics at work* texts in Chapter 6 we show how the illustrations accompanying

Tasks and Units also function as relays of recognition and realisation rules. In Chapter 7 we demonstrate in detail that the pedagogy demands very specific forms of realisation of students. The chief resource for achieving the required realisations is made available through the questioning of students by teachers.

TP 3: Recognition and realisation rules are transmitted and acquired through the (empirical) occurrence of *evaluative events* in a pedagogic context. An evaluative event can vary in temporal extent.

In each of the instances where some or other mathematics content was to be transmitted and acquired, in the case of both the *Mathematics at work* texts as well as the exemplars of pedagogic activity, the content is always situated within a temporal sequence which had a beginning and an end. In the case of the *Mathematics at work* texts temporal sequences are realised in the form of Tasks and Units and within those, as individual problems. In actual pedagogic activity temporal sequences are similarly marked by the presentation of the student with some or other problem or question and the time it takes to reach a point in which the problem or question is considered to be resolved. The movement through a temporal sequence is subject to a series of evaluations. Each such temporal sequence constitutes an evaluative event.

TP 4: For an event to be an *evaluative event* it must be subject to the operation of *pedagogic judgement*, where *pedagogic judgement* is understood to be the means by which the flow of discourse is punctuated to reveal instances of legitimate recognition and realisation; that is, to produce specialised meanings.

This proposition is merely an extension of axioms 1 to 3 and is covered by the discussions on those.

TP 5: Pedagogic judgement splits the content that is to be acquired into a subject and one or more predicates. At the level of the text that, on the hand has to be engaged with by the pedagogic subject, and on the other, the text s/he is required to produce in response, the content is split between a *missing representation* (the intended content for acquisition) and a *representation of the missing representation* (the text that is to be engaged with).

The teacher's guides to the *Mathematics at work* texts clearly indicate what the intended mathematics contents of particular Tasks, Units and individual problems are, and in that way indicate, at least to the teacher, what the missing representation (MR) is. What is given at the outset in problem statements, for both the *Mathematics at work* texts and the video records of actual pedagogic activity, stands in the place of the mathematics contents to be acquired and therefore function as representations of the missing representations (RMR). In Chapters 4 and 8 we see that the arrival of the student's text at the missing representation is contingent on the production of a field of possible predicates for filling out the intended mathematics content.

TP 6: The operation of pedagogic judgement is itself always subject to a *temporal unfolding*.

There is always a temporal unfolding of pedagogic judgement because otherwise we would have to assume that all knowledge, including knowledge yet to be announced, is always-already present to individual consciousness (so that the specialisation of consciousness could be realised instantaneously by merely selecting the correct combinations of knowledge). Every organisation of contents for the purposes of teaching and learning, including the *Mathematics at work* texts, is constituted as a sequence to be acquired over time.

TP 7: The need for the operation of pedagogic judgement presupposes the *existence of knowledge* and also the existence of at least *two pedagogic subjects*, or subject-positions: (i) a subject-supposed-to-know and (ii) a subject-supposed-not-to-know. The former has a *transmission-function*, the latter an *acquisition-function*.

Empirically these two subject-positions are, respectively, according to the social division of labour, most commonly filled by the teacher and the student. More generally we might say the operation of pedagogic judgement supposes, in addition to, and correlative to, the existence of knowledge and a place of its absence, the existence of a *transmission-function* and an *acquisition-function*. This simply means pedagogic agents are routinely positioned as doing the work of transmission or acquisition. Any given empirical pedagogic subject can, of course, be positioned in both ways. For example, when a student is placed in the position of having to teach another, the pedagogic discourse has distributed a transmission-function to that student. Such distributions are discussed in detail in Chapter 7.

TP 8: The distribution of the transmission- and acquisition-functions always produces a disequilibrating *split* in evaluative events in the form of a supposition of a position where knowledge exists and a position where it is absent. In different terms, evaluative events must always *stage* such a split between knowledge and its absence.

This proposition is simply an extension of TP 7 but emphasises that the posing of a question, or a confrontation with problem, produces a distinction between the supposition of the existence of knowledge and of its absence somewhere. In Chapter 7 we see a good example of how such a split is produced in the context of actual teaching and learning.

TP 9: The manner in which the split between the positions of the presence and absence of knowledge is staged can vary across evaluative events and, of course, across modalities of pedagogic discourse and practice. The paradigmatic form of the split is constituted in the distribution of the presence of the knowledge which is to be acquired to the teacher and its absence to the student. This is termed the *paradigmatic form of evaluation* since it is a general condition of possibility for pedagogy.

This proposition merely formalises the general form of evaluation within pedagogic relations. The staging of all other evaluative forms in the context of the reproduction of knowledge are understood as embedded within the general form of the paradigmatic form of evaluation.

TP 10: One aim of pedagogic judgement is to momentarily restore equilibrium by *excising the split* between the presence of knowledge and its absence *by negating that which represents the absence of knowledge* with respect to the student.

Without the negation of the representation of the absence of knowledge, consciousness cannot begin to be specialised because without substituting the absence of knowledge with its presence no learning has taken place. The manner in which the split is excised can, of course, vary over evaluative events. If this was not the case then all evaluation would take a single form. Chapter 7 shows examples of different evaluative forms.

TP 11: Pedagogic judgement splits the productions of the pedagogic subject into that which is *enunciated* and the *place from which the enunciation is made*, the latter is presumed to be the locus of the *jouissance* of the pedagogic subject. The former is termed the *subject of the enunciated* and the latter, the *subject of the enunciation*. The subject of the enunciation is, strictly speaking, a hypothetical subject retroactively constructed from an evaluation of that which is enunciated.

Bernstein (1996) argues that within competence-type pedagogic modalities the acquirer is the text to be read in evaluative acts, which is why the teacher needs a theory of reading the child. The child is read not only from what text s/he produces but also, importantly, from how s/he produces the text. We shall see in the teacher's guides to the *Mathematics at work* texts that the authors are concerned with the "attitude" of the student, reading types of student questions as indicating the nature of the place from which the student speaks. From Lacan's more general position on the enunciations of the subject within language, however, we would argue that the reading of the student's text is always also read for the place from which it is produced. That the teacher operating within a performance-type pedagogy does not have an elaborate theory of reading the child does not mean that the (presumed) place from which the student's text is produced is not evaluated.

TP 12: Two central modalities of identification pertain in any pedagogic relation: *imaginary identification* and *symbolic identification.* The former is the modality associated with the ideal ego and the latter, with the ego-ideal.

This proposition derives directly from Freud and Lacan. Imaginary and symbolic identification are centrally implicated in processes of "socialisation," of which schooling is one context. In Chapters 6 and 7 we detail the workings of imaginary and symbolic identification as well as the relation between the two.

TP 13: Pedagogic judgement also splits the subject of the enunciation between a position aligned with the ideal ego (imaginary identification) and a position aligned with the ego-ideal (symbolic identification). See Figure 3.3 in Chapter 3.

This proposition derives from Lacan and follows on from TP 12. The subject as ego enjoys the illusion of unity which is a sedimentation of imaginary identifications constituting the ideal-ego. The induction of the subject into the symbolic ("socialisation"), however, entails a confrontation between the subject and its social positioning in the form of an ego-ideal. In more Kleinian terms we might say that the ideal ego is the ego as imaginary projection and the ego-ideal is the ego as symbolic introjection. In one way or another, symbolic introjection always has to contend with imaginary projection, so that a reading of the subject of the enunciation in the terms of pedagogic judgement is a symbolic introjective reading of an imaginary projection.

4.6.3 Propositions serving as research hypotheses (RH)

We are now finally in a position to state the central research hypotheses of this project.

RH 1: Regulative discourse drives the pedagogic subject towards pedagogic judgement through the imaginary-symbolic dialectic by employing pedagogic strategies that attempt to shift the identification of the pedagogic subject with the Imaginary to an identification with the Symbolic.

RH 2: The pedagogic subject's enunciations of pleasure issue from an injunction to enjoy emanating from regulative discourse.

RH 3: The image of the student as an autodidact is a necessary fiction, the purpose of which is to mask the inevitable alienation that inheres in the acquisition of specialised knowledge.

Having established our propositions we can now move to a consideration of the production of data. Note that when we present the external language of description in its fully developed form, in the next Chapter, it will appear in the form of a model before the data is discussed and analysed. However, in order to construct the model we have to engage with the procedures for the production of data.

Chapter 5

Procedures for the production of data

The central object of this Chapter is the construction of procedures for the principled production of data from the archive of information constituted by the *Mathematics at work* textbook series and the videotext of exemplary problem-centred approach teaching. In order to construct the analytic methods for the production of data we first needed to produce an appropriate general methodological orientation (theory), which was the work of Chapters 2, 3 and 4. The general methodology, which is constituted by selection from a range of theoretical referents, nevertheless rests heavily on Bernstein's theories of the pedagogic device and languages of description. Additional influences on the design of the research study derive from the work of Freud and Lacan, especially the latter's theory of discourse, from the work of Hegel on judgement, and also from that of Dowling on languages of description and the analysis of pedagogic texts. Dowling's discussion of languages of description is used to organise this work but his more general work is not discussed in detail.

5.1 The idea of a language of description

Bernstein (1996: 135) defines a language of description as "a translation device whereby one language is transformed into another." He goes on to distinguish between "internal and external languages of description" (ibid.). The difference between the two is the following: "The internal language of description refers to the syntax whereby a conceptual language is created" (ibid.) while an external language of description refers to the syntax whereby the internal language can describe something other than itself" (Op.cit.: 136). In our case the internal language of description derives, chiefly, from Bernstein (1996), Lacan (1998), Hegel (1969) and Dowling (1993, 1998). The selection of theoretical referents that inform the production of the internal language of description is done in "dialogue" with the empirical specificity of the object(s) of research. Once the internal language of description has been constructed the researcher needs to produce the external language, the work of which is to "construct what is to count as empirical relations and translate those relations into conceptual relations. A language of description constructs what is to count as an empirical referent, how such referents relate to each other to produce a specific text, and translate these referential relations into theoretical objects or potential theoretical objects. [...] A language of description, from this point of view, consists of rules for the unambiguous recognition of what is to count as a relevant empirical relation, and rules (realisation rules) for reading the manifest contingent enactments of those empirical relations" (Op.cit.: 136-7).

At this stage it might help to reproduce a diagrammatic representation of the idea of a language of description from Dowling's discussion of languages of description (Figure 5.1).

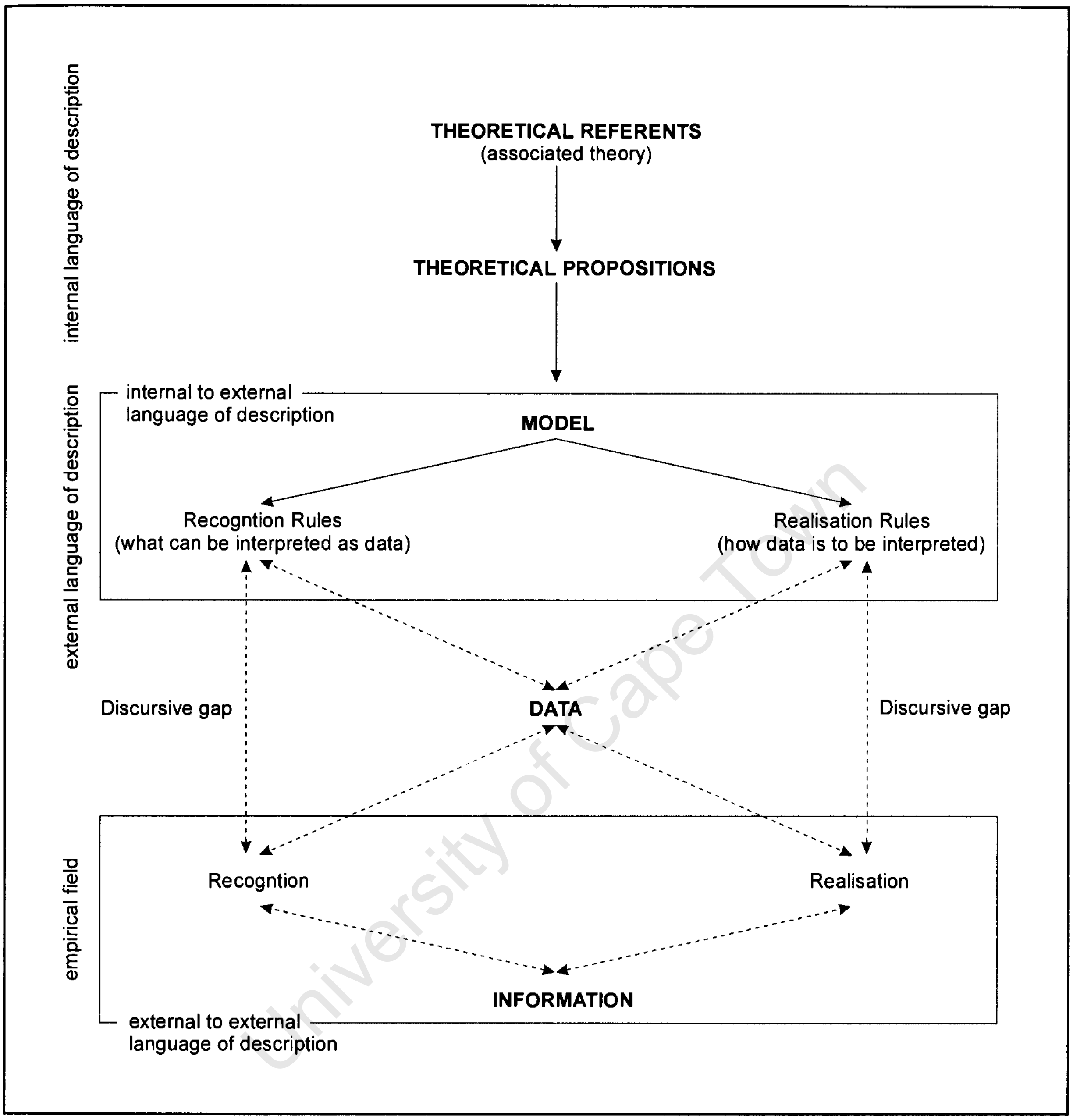


Figure 5.1: Schema for a language of description (Dowling, 1993: 88)

From the theoretical referents, in dialogue with the empirical specificity of the object of research, we produce a series of theoretical propositions. The external language of description proper is constituted by a model, derived from the theoretical propositions, as well as recognition and realisation rules for the identification and interpreting of data, which must be such that the model can grasp the data. However, it has to be borne in mind that the recognition and realisation of data always closes down the initial openness of the information by restricting its semantic potential—the model cannot exhaust the empirical because the latter represents a material excess with respect to the discursive (the model). This is why data is shown to reside in a "discursive gap", which is a "methodological space" (ibid.) between that which is external to the external language of description and that which is internal to it.

In Chapter 6 we discuss features of the Grade 1 to 4 *Mathematics at work* texts that enable us to reveal the working of the Imaginary-Symbolic dialectic. The Grade 1 to 4 texts of the series were selected because those were the texts that had been rewritten for use with Curriculum 2005 at the time when this project was begun. Texts for the other grades were still in the process of being adapted for the new curriculum and were not yet subject to structuring in terms of the same pedagogic principles of the Grade 1 to 4 texts.

In Chapter 7 we discuss empirical instances of teaching and learning that the authors of the *Mathematics at work* series consider to be exemplary of the problem-centred pedagogy. The originators of the pedagogic "approach," as they refer to it as, were asked to make available for analysis video records of teaching and learning, preferably across a range of socio-economic contexts. They were asked to provide the video material in order to avoid the problem of having our selections of what we might think are good examples being dismissed as inappropriate, and therefore as not instances of the realisation of the pedagogy. To that end they selected and supplied video records of teaching and learning in five different classrooms across three schools: (1) two classes in an English-medium private school for girls (Grades 2 and 3) and interviews with five Grade 3 students; (2) two classes in an English-medium, predominantly "coloured" public school situated on the Cape Flats (Grades 2 and 3); (3) one class in an Afrikaans-medium, predominantly white public school (Grade 2), interviews with eight students and an interview with the teacher. Since the authors were not able to gain permission to do research and development work in schools situated in black townships, no footage of teaching and learning in such schools was available. The video records made available are part of an archive of raw footage used in the production of episodes of an educational television series, *Awethu*, which was broadcast nationally by the South African Broadcasting Corporation. Therefore, when considering the video records provided by the authors it should be noted that the video footage was gathered by the originators in order to construct a series of pedagogic texts promoting a problem-centred approach to teaching in such a way that *different elements of the approach* are emphasised in each instalment of the series. This means that the video records are not of the type we might usually collect when conducting educational research: that is, they do not present a sustained focus on the same classes of phenomena across different schools and classrooms for the purposes of comparison and in order to distil from that the general features of the pedagogy. Here the universal, in the terms of the pedagogic principles of the "approach," is already at work in the structuring and production of the video records from which footage was selected and edited into a series of proselytising texts on how the pedagogy ought to be realised. That said, the raw video footage nevertheless does provide insights into the effects of context-specific structuring on the pedagogy.

5.2 The production of data

The issue we now have to address is that of how to approach the evaluative rule of the device when considering our archive of information. The first thing we have to do is identify evaluative events. The evaluative event is the primary unit of analysis for the production of data revealing (1) the temporal elaboration of mathematics contents and (2) the distribution of transmission- and acquisition-functions (discussed in Chapter 4). In the context of analyses of textbooks the term *evaluative event* refers to Tasks and Units as self-contained sequences with a clearly marked beginning and ending. In the context of analyses of actual classroom activity, the evaluative event is a sequence of activity that spans the elaboration of a particular content. At this stage the archive of texts to be analysed is to be considered as merely a collection of information—an information-set—pertinent to our research interests. What we now need is the construction of a set of fundamental analytic resources for the transformation of the information into data.

5.2.1 Recognition and realisation of the split

To recognise the split that is produced at the moment of immediacy which we discussed in Chapter 4 we had to identify the notion *qua* missing representation, the representation of the missing representation (that which stands in place of the notion), and also the categories of a split at the level of pedagogic subject-positions (transmission-functions and acquisition-functions). Let us render our discussion less abstract by referring to an example. Consider the task shown in Figure 5.2.

> Our favourite islanders have some relatives on a nearby island. These relatives have only four fingers (including the thumb) on each hand and they never use their thumbs when counting. Their counting is very limited and they use the following symbols:
>
> I Γ Π □ H Γ
>
> Which are equivalent to our 1, 2, 3, 4, 5 and 6.
>
> (a) Explain to them how they could write many more numbers by using the number zero and only the first **five** symbols above. Explain the "placeholder" notation which would be appropriate for these islanders.
> (b) Draw up an addition table which they can use to add any two single-digit numbers.
> (c) One of the islanders wants to add Γ □ H to Γ I I; explain to her how to find the answer. Remember: she wants to understand **why** your method works; just telling her the rule is not enough.
> (d) Show how you could use your addition table to calculate □ X H.
> (e) One advanced islander says he has noticed that □ X H is the same as H X □ and wants to know if this is true when any two numbers are multiplied. Of course the answer is yes, but draw him a diagram which will convince him of this.
> (f) Explain to the islander how to multiply Γ Π by □. She should be able to understand why your method works; giving the rule is not sufficient.

Figure 5.2: Task given to teachers attending an elementary algebra course

Here we encounter a description of a group of fictitious islanders who use a fairly unsophisticated "number system" which does not include the concepts of zero and place value. The task of the student is to present the islanders with an argument enabling them to use the concept of zero to construct a number system that includes a place value notation and also enables them to perform simple addition and multiplication.

The task as a whole is concerned with facilitating a principled understanding of the structure of the number system as opposed to merely knowing how to perform simple arithmetic operations on counting numbers. At a global level the missing representation is the *structure of the number system* and that which stands in place of the missing representation is *knowledge of the rules for performing arithmetic operations on numbers.*

At the level of pedagogic subject-positions the *student is made to stand in the place of the transmitter of mathematics* (transmission-function) and the *islanders in the place of the student* (acquisition-function). In different terms, the student is associated with mathematical knowledge (having knowledge of the structure and of the rules for performing arithmetic operations on numbers) and the islanders with the absence of that knowledge. Here we see how the split between the missing representation and the representation of the missing representation is redoubled at the level of the pedagogic subject: the narrative serves as a device that splits off and externalises the absence of knowledge in the student, displacing it so that it is imaginarily materialised in the islanders.

5.2.2 Recognition and realisation of the movement of the notion

Now that we have identified the split and the manner in which it is produced, we should ask how the move from immediacy to necessity is set in motion. Significantly, the islanders are made to ask "Why …?" to the student (who inhabits the place of the transmission-function): "Remember: she wants to understand **why** your method works; just telling her the rule is not enough." Also, "One advanced islander says he has noticed that □ X H is the same as H X □ and wants to know if this is true when any two numbers are multiplied. **Of course the answer is yes, but draw him a diagram which will convince him of this**." (Our emphasis.) So the islanders act as a *questioning subject* confronting a master and the student has to construct new signifiers (knowledge) to pacify them—they who are nothing other than the representation of the student *qua* obstacle to that which is to be acquired and reproduced. The reflexive "Why …?" coming back at the student *qua* transmission-function from the islanders marks the movement from the moment of immediacy to that of reflection. The arrival at the moment of necessity is contingent on the student producing a *mathematically adequate answer* to the "Why …?" And who is the judge of the mathematical adequacy of the student's response, of whether or not the student has established necessity? At the end of the day it must be the teacher holding the symbolic mandate of mathematics education. The judgement thus produced by the teacher represents the moment of the judgement of the notion. To the extent that the student is successful in establishing necessity, the internal split is momentarily excised and, locally at least, a moment of unity of the student with mathematics is established. The operation of the judgement of the notion, however, simultaneously with the student's sense of unity, re-configures the split. This re-configured split identifies the transmission- and acquisition-functions with the teacher and student, respectively.

In the example just discussed it is clear that an attempt is being made to hold the split internal to the student in place up to the moment of necessity. However, not all tasks are constructed in that way. Consider the task shown in Figure 5.3.

3. Bereken elk van die volgende limiete indien hulle bestaan. */Evaluate each of the following limits if they exist.*

(a) $\lim_{x\to 3}\dfrac{x^2-x+12}{x+3}$ (b) $\lim_{x\to 4}\dfrac{x^2-x-12}{x-4}$ (c) $\lim_{x\to 1}\dfrac{x^3-1}{x^2-1}$

(d) $\lim_{x\to 2}\dfrac{\frac{1}{x}-\frac{1}{2}}{x-2}$ (e) $\lim_{x\to 0}\dfrac{x}{\sqrt{1+3x}-1}$ (f) $\lim_{x\to 1}\dfrac{\sqrt{x}-x^2}{1-\sqrt{x}}$

Figure 5.3: Task given to teachers on an elementary calculus course

In Figure 5.3 we encounter a task where the rehearsal of a method, or procedure, is called for. When we ask what the speculative identity is that resides at the moment of immediacy we find that the missing representation is a solution (rehearsal of a known procedure) and the representation of the missing representation is the problem statement (for example, evaluate the limit λ, if it exists). Here necessity has already been established *at a moment external to this evaluative event.* All that is required is for the student to write out the solution according to the procedure and for the teacher to announce a judgement on whether the solution corresponds to its notion (the procedure, in this case). Ironically, the split is maintained as internal to the student only if the student *does not know, or cannot recall, the procedure*. To the extent that the student does know the procedure, the moments of immediacy, possibility and necessity are collapsed into a single moment, because necessity has *already been established elsewhere*—and, in its becoming, necessity entails both immediacy and reflection. From this it follows that, strictly speaking, *we do not have a speculative identity at the moment of immediacy as concerns mathematics.* What we mean by the last statement is that the problem statement (the representation of the missing representation) and the solution (the missing representation) demanded stand in tautological relation to each other in mathematical terms. The student's work is not to establish the tautology but rather to demonstrate that s/he does not disrupt it. We represent this situation diagrammatically in Figure 5.4.

In more familiar terms, it would appear that one of the most distinctive differences between the tasks shown in Figures 5.2 and 5.3 is that, in the task of Figure 5.2, students are required to demonstrate an ability to produce mathematical necessity while the task in Figure 5.4 demands only that they reproduce it. What emerges with this type of task is a situation in which the student *qua* obstacle is not being engaged other than in the form of an implicit threat of being judged to lack mathematical knowledge. The specificity of the student *qua* obstacle is not asked to be revealed, as is the case in the Figure 5.2 task. Of course the teacher can attempt to establish the specificity of the student *qua* obstacle through diagnosing an attempted solution offered for evaluation, but the pedagogic constructivists (in mathematics education) have convincingly demonstrated that student responses to tasks of the type shown in Figure 5.4 generally do not reveal sufficient about a student's conceptual difficulties (and resistances) to enable productive diagnosis and remediation. The point is that it is relatively easy to transmit and acquire signifiers—all one needs are reliable transmission and recording devices (like writing down notes from the chalkboard, or writing out passages from a book)—but it is much more difficult to transmit and acquire the signifieds (notions/ideas) intended to be indexed by the transmitted signifiers. The latter requires more than mere recording (and playback) of that which is transmitted.

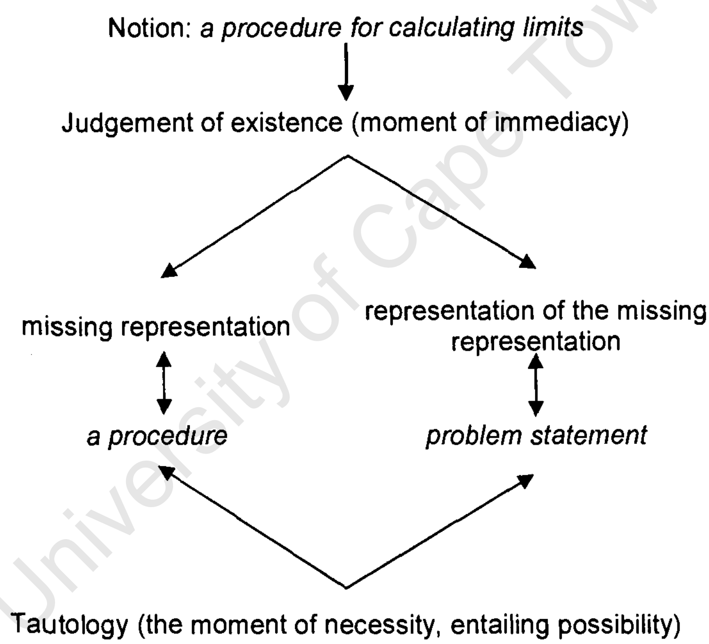


Figure 5.4: RMR-MR split in procedural elaboration of contents at the moment of immediacy

A few more difficulties need to be dealt with apropos of the movement of the notion. First, the tasks used above were chosen because they allowed for an economical elaboration of the key ideas employed here. However, as we saw in Chapter 4, the movement of the notion is not necessarily to be found in a single task. Indeed, it appears that it is more often the case that the movement of the notion spans a series of tasks. In the context of a textbook, the series may be one or more chapters or modules and may even be spread out across a text, interspersed with other topics, rather than found in a strict, closed sequence. It is not unreasonable, then, to find a relatively lengthy sequence of tasks that are focused primarily on, say, the moment of reflection without any necessity being established over such a sequence. We can expect so-called inductive pedagogies to employ such task sequences. Therefore, an examination of the movement of the notion may well demand, at the level of an empirical text, the examination of an *evaluative event series* rather than of a single evaluative event. In the absence of an exhaustive analysis of an empirical text, recognition of the possible need to examine series of evaluative events must impact on the manner in which we sample a text. The descriptive categories enabling the production of data, especially those concerned with describing the movement of the notion, exclude the use of a simple random sampling of an empirical text in which we divide the text up into discrete tasks and then analyse a random sample of those tasks. For the reasons outlined above, we are forced to first identify different evaluative event series and then constitute a sample from those series.

Second, following from the expectation that the evaluative event series will have to be examined in order to assess the movement of the notion, the categories of reflection and necessity need to be more carefully elaborated for a number of reasons. It is conceivable that reflection is generated through strategies aiming at subsumption, which is an essential feature of reflection as it moves towards necessity in the sense that an increasing quantity of phenomena are subsumed under a characteristic that begins to function as a universalising predicate. For example, in attempting to arrive at the notion of a rational number (that is, "fractions" as the rational numbers are commonly referred to in schooling), the idea of the division of integral quantities into an equal number of parts begins to function as a universalising predicate. Once the idea of division into an equal number of parts begins to take hold and function as a universalising predicate an increasingly wide diversity of subjects can be described in terms of it; that is, an increasing quantity of phenomena are subsumed under it. The movement in such a case is on the side of the subject rather than the predicate, which is qualitatively different from what happens at the moment of the judgement of existence. In the latter case the movement is on the side of the predicate: the encounter with a mere "that" which characterises the judgement of existence calls for an attempt at predicating it, of "making sense." However, the predicates which are used to describe the subject are merely features attached to it rather than its essence. Staying with the example of the notion of a rational number, we may find that Grade 1 students are introduced to that notion by confronting them with a problem requiring that they describe how three chocolate bars should be shared equally between two children, as in Task 16 of *Mathematics at work, Grade 1* (p. 19), where the first problem of the Task is stated as: "Susan and Sita have 3 chocolate bars. How can they share the chocolate equally? Draw your answer." Here the authors make it apparent that *all* of the chocolate bars have to be shared out—possibly for the reason that it is a perfectly valid solution in an everyday setting that each child be given a single chocolate bar with the third not consumed—by showing the character Sita holding a knife at the ready (see Plate 5.1).

At this point the substantial element is the equal sharing of the chocolate rather than the idea of a rational number (fraction), and the division of the third chocolate bar into two equal parts is merely a consequence of the requirement of equal sharing. The next problem is: "Susan, Sita and Sikelele have 4 chocolate bars. How can they share the chocolate equally? Draw your answer." In the accompanying illustration, Sita again holds up a knife. Here the fourth chocolate bar is to be divided into three equal parts. The idea of division into equal parts is now starting to be invested with substantial existence in its own right: while it was a mere consequence of the demand that sharing be equal in the two problems, the cutting of the bars into equal parts now starts to function as a more general strategy by virtue of its repetition in conjunction with the requirement that it be represented in the form of a drawing ("Draw your answer"). Later we see the same strategy put to use in other everyday settings where different textual characters share out objects (bread, balloons, more chocolate, sweets) so that division into equal parts begins to function as an essential feature, as the "sense", of each of those everyday settings and in that way subsumes them. While we are still a long way from the notion of a rational number, a ground for the notion has been made somewhat substantial by way of the intermediate notion of division into equal parts: all fractions are produced by dividing a thing into equal parts.

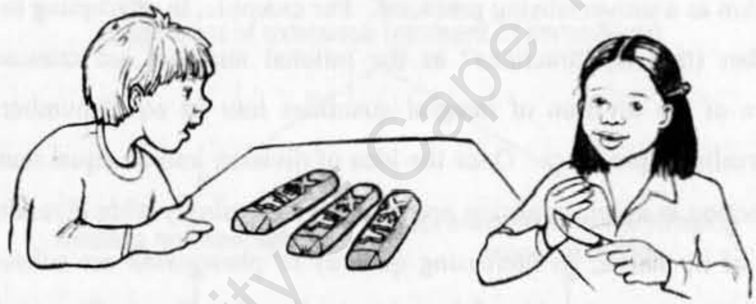


Plate 5.1: Sharing 3 chocolates between 2 children (*Mathematics at work, Grade 1*, Task 16: 19)

The movement from the judgement of reflection to that of necessity entails an almost imperceptible shift in emphasis: from the description of the common result arising from considering the collection of empirical experiences of "equal sharing" (*all* fractions are produced by dividing a thing into equal parts) we arrive at the proposition that *fraction, as such, is the result of dividing a unit into equal parts*. Here division into equal parts is no longer concerned with the empirical situations we encountered earlier but rather with the immanent self-determination of the notion. In other words, we are no longer concerned with the actual existence of the subject, of whether or not any situation demands that we "share equally", but rather with the essential nature of a fraction.

For now, what we have discussed here should suffice as a demonstration of the methodology to be employed in the production of data as concerns the movement of the notion and the production of subject-positions. We can now consider ways of streamlining the methodology into a procedure.

5.2.3 Summary of the procedure for producing data on the notion and subject-positions

Beyond the identification of evaluative events and texts that participate in evaluative events (tasks, for example), we saw that four key elements are required for the production of data:

(i) *Identification of an evaluative event or the evaluative events that constitute an evaluative event series*. The identification of the event or event series is predicated on the recognition of isotopic markers associated with a particular notion. Such markers may, for example, be constituted by the arrangement of a text into topic or, as in the case where topics are masked by the use of non-disciplinary referents, statements in documents like a teacher's guide where authors more explicitly state what particular tasks are about as concerns mathematics.

(ii) *Identification of the split between the missing representation (which corresponds to the notion) and the representation of the missing representation (that which stands in the place of the notion)*. The identification of the split at this stage tells us about the structure of the moment of immediacy, which is what confronts the student in the judgement of existence.

(iii) *Identification of the split in terms of the subject-positions (transmission- and acquisition-functions) which marks the distribution of knowledge of the notion and the absence of the notion to empirical pedagogic subjects*. We saw that this aspect of the split can be realised either inter- or intra-subjectively at the moments of immediacy, possibility and necessity but is inter-subjective at the moment of the judgement of the notion, where the transmission- and acquisition-functions are identified with different empirical pedagogic subjects. Here we should bear in mind that while competent students may be able to assess their own work, ultimately the teacher and examiners have the final say in assessment. This also does not gainsay the fact that teachers can be wrong in their assessments and that there are instances of students being more competent than their teachers. Ultimately, it is the teacher who holds the symbolic mandate and a field of knowledge cannot assert a judgement other than through some agent granted a symbolic mandate by the field.

(iv) *Identification of the movement of the notion.* Does the notion move from immediacy to reflection to necessity and then to the judgement of the notion? Or do we have an apparent leap from immediacy to the judgement of the notion? Or does the notion stall at the moment of reflection without any necessity being established, as would be the case in instances where, after reflection, no universal punctuation is arrived at because everyone must be allowed to have their own opinion validated? In the last case the judgement of the notion is suspended, or, at least, apparently localised to individuals, but then we do not have a notion—an individualised form of pedagogic populism. Or is an apparent necessity established in an authoritarian manner (I rule here, so you'd better believe what I say) or by a communal form of pedagogic populism (let's vote), rather than by establishing mathematical necessity? In the latter case we have the production of a communal opinion—the authoritarian modality is a forced communal opinion—rather than the circulation of individual opinions as in the previous case. Both forms of opinion are, by definition, local rather than universal.

A few further points now need to be made with regard to the possibilities offered by the archive as regards (ii) and (iii), the split. If we restrict ourselves, for the moment, to referring only to the reproduction of mathematics for the sake of simplicity, we note the possibility that both the missing representation and the representation of the missing representation can be either mathematical or non-mathematical. Also, the transmission-function can be identified with the teacher, or with the student, or with some other agent (virtual or actual). When considering the acquisition-function we note that (ii) when it is identified with the student, the student can be identified *as student* or as some other agent (student-as-islander, for example), or (iii) the acquisition-function can be identified with some other agent.

With the inclusion of these additional elements we have a reasonably robust description of the fundamental mechanism (procedure) for recognising and realising the split in both of its modalities. We can clarify things further by representing the procedure in the form of a network of relations. Figure 5.5 shows a branch of the network summarising the procedure at the level of the notion.

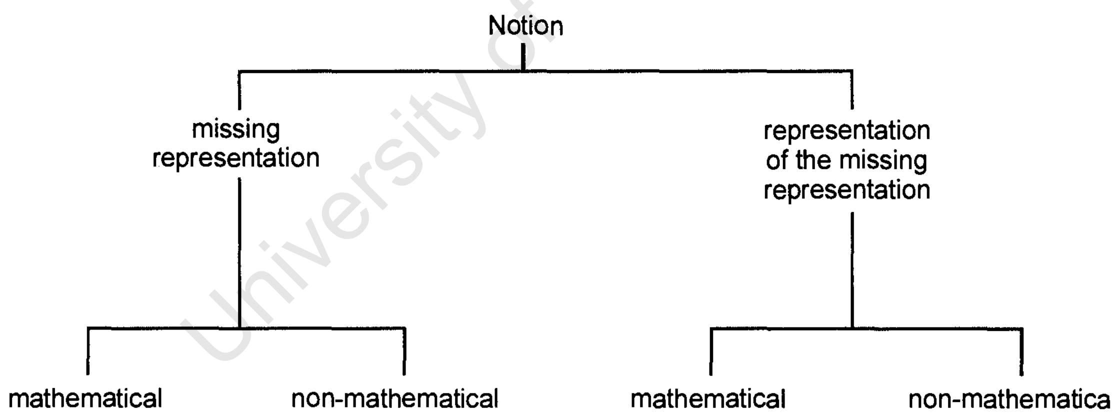


Figure 5.5: Network showing the split at the level of the notion

We can extend the network shown in Figure 5.5 as we proceed with the production of data and the analysis by adding more branches to the lower nodes of the network—to those indicated as *mathematical* and *non-mathematical*. For example, it might prove productive to describe the subject of the mathematical as referring to a mathematical concept (e.g., equation) or a structure (e.g., number system) or a procedure (e.g., technique for finding a limit). Similarly, we can describe the subject of the non-mathematical as referring to various categories of non-mathematical objects or activities. For example, the non-mathematical could be domestic activity or work or recreation, or even some other field of knowledge (e.g., science).

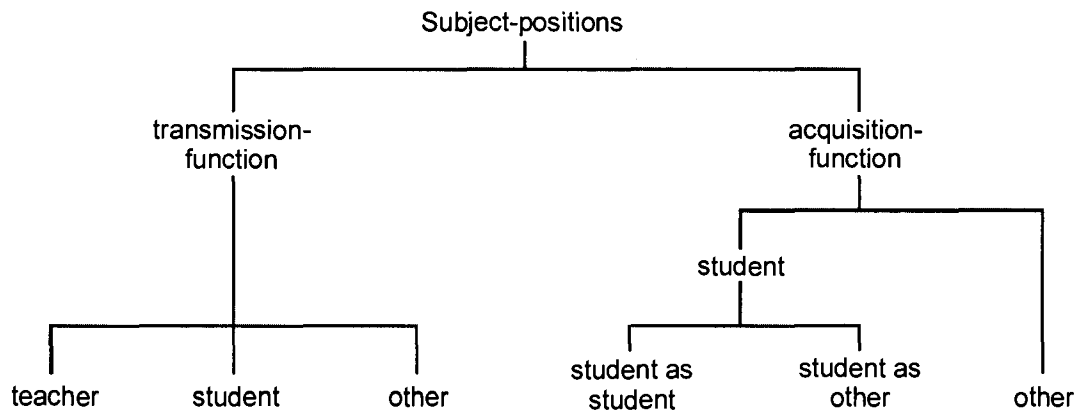


Figure 5.6: Network showing the split at the level of subject-positions

The branch of the network showing the split at the level of subject-positions is shown in Figure 5.6. We may need to extend the network, if productive, to refer to sub-categories of teacher, student and other.

The two branches of the network shown in Figures 5.5 and 5.6 can be combined under the category of immediacy to produce a larger network. However, for the purposes of coding tasks and evaluative events it is more convenient to use tables for the purposes of recording the data production, that is, as coding grids. Table 5.1 is an example of such a coding grid.

	Subject-positions					
	transmission-function			acquisition-function		
				student		
Evaluative event	teacher	student	other	student as student	student as other	other
description	0	1	0	0	1	0
X	1	0	0	1	0	0
Y	0	1	0	1	0	0

Table 5.1: An example of a possible coding grid for the production of data on subject-positions

The last row of the Table 5.1 example (which is actually the first row showing the initial coding of information from an information-set) shows an abbreviated reference to an evaluative event (description) and either 0 or 1 in the cells associated with the lowest nodes of the network. We can read the string of zeros and ones as informing us that the transmission-function is assigned to the student and the acquisition-function is assigned to the student-as-other. Clearly we can set up a similar coding grid for the split with respect to the notion.

We can now consider the task of producing data that captures the excision of the split; that is, the movement of the notion from immediacy through reflection and necessity to the judgement of the notion.

In dealing with the excision of the split we are referring to a detectable trajectory from the moment of the judgement of existence to the moment of the judgement of the notion. Recall that the four moments of judgement are those of (i) existence, (ii) reflection, (iii) necessity and (iv) the notion. If we now consider the task shown in Figure 5.3 once again, we can recognise a movement through the judgements that we can represent as ***Existence → Reflection → Necessity → Notion***. With reference to the task shown in Figure 5.4 we get, for the reasons discussed earlier, ***Existence → Notion***.

	Movement of the notion			
Evaluative event	***Existence***	***Reflection***	***Necessity***	***Notion***
X	1	1	1	1
Y	1	0	0	1

Table 5.2: an example of a possible coding grid for the production of data on the notion

Recording our work in this way allows us to produce a composite coding grid in which each evaluative event is captured as a sequence of zeros and ones (see Table 5.3).

	Notion				Subject-positions						Movement of the notion			
	MR		***RMR***		***T-F***			***A-F***						
								S						
EE	***M***	***~M***	***M***	***~M***	***T***	***S***	***O***	***S-S***	***S-O***	***O***	***E***	***R***	***N***	***C***
X	1	0	1	0	0	1	0	0	1	0	1	1	1	1
Y	1	0	1	0	1	0	0	1	0	0	1	0	0	1

Table 5.3: Composite coding grid

Key to Table 5.3
EE: Evaluative Event

Notion
MR: Missing Representation, *RMR*: Representation of the MR
M: Mathematical, *~M*: non-mathematical

Subject-positions
T-F: transmission-function, *A-F*: acquisition-function, *S*: Acquirer
T: Transmitter, *S*: Acquirer, *O*: Other

S-S: Student as acquirer, *S-O*: Student as other, *O*: Other

Movement of the notion
E: (Judgement of) Existence, *R*: Reflection, *N*: Necessity, *C*: Notion

5.2.4 Procedure for producing data on references to pleasure and work

In Chapter 2 we argued that the appeal to "fun" in texts designed for use with Curriculum 2005 is a strategy through which acquirer is commanded to be enjoy in a specific way. The enjoyment of the acquirer is, however, to be intimately bound to "relevance"; that is, to the acquisition of contents and skills that will apparently prove productive and useful in life beyond schooling: in the workplace, family and community life. Recall that Tables 2.4, 2.5 and 2.6 of Chapter 2 summarised the references to "fun" (77.6% of Tasks and Units overall) and work (45.7% of Tasks and Units overall) found in the Grades 1 to 4 *Mathematics at work* texts. Here we detail the method used to transform the information constituted by the texts into the data reported on in Tables 2.4 to 2.6 of Chapter 2. We deal with the simpler of the two first, which is work.

5.2.4.1 Producing data on references to work

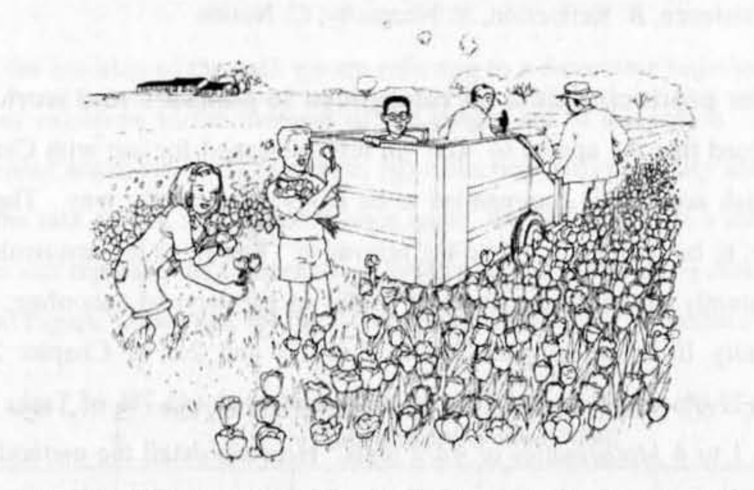
In Chapter 2 we indicated that the Grades 1 to 3 texts differ from the Grade 4 texts in a number of ways , and we therefore separate them in our discussion here. We deal with the Grades 1 to 3 texts first.

Mathematics at work, Grade 1 to Grade 3

The *Mathematics at work* texts (Grades 1 to 3) present Tasks in an A4 format with much of the page space taken up by pictorial text. A typical Task is shown in Plate 5.2.

The particular activities depicted in the illustration and the alphanumeric text on the page are those of farming and trading. Question 1 of the task indicates that the children have been employed to pick flowers, hence we have children involved in labour. Question 2 refers to an instance of trading in that the reader is told that a florist has ordered flowers from the farmer. From this example we see that references to work are indicated pictorially as well as discursively and that more than one moment of the social division of labour can be referenced: farming and trading. Also, given that we are interested in the relation of the acquirer to work, we can note that an image (pictorial and discursive) of children involved in extra-mathematical labour is presented. Looking across all the texts (including *Mathematics at work, Grade 4*), examining each task, we found that 17 different categories of extra-mathematical activity could be identified: *Farming*, *Trading*, *Retail*, *Manufacturing*, *Transport*, *Construction*, *Postal services*, *Fishing*, *DIY*, *School administration*, *Cottage industry*, *Environmental work*, *Health care*, *Community service*, *Travel*, *Shopping* and *Housework*.

96. Helping on the farm



1. Conrad, Vuyani and Belinda help Mr Davis to pick flowers. Conrad works for 2 Saturdays, Vuyani also works for 2 Saturdays, and Belinda works for only 1 Saturday.
   Mr Davis gives them R75 in total. How must they divide the money so that each of the three children is paid in a fair way?
2. The flower shop has ordered 4 bunches of roses, 8 bunches of carnations and 12 bunches of zinnias. A bunch has 15 flowers. How many flowers of each kind does Mr Davis need?

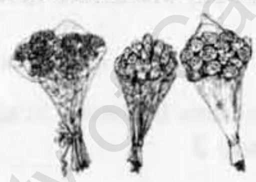


Plate 5.2: Task 96, *Mathematics at work, Grade 3*: 169

In a single instance adults at work were referenced but no specific category of work activity could be assigned. For example: "7 workers must be paid R120 each. How much money is this altogether?" (*Mathematics at work, Grade 4*: 232) We referred to such instances of reference to work as *Generic adult work*. In addition to the categories of work activity described here there were a number of instances in which children were depicted as involved in performing tasks, an example of which can be seen in Plate 5.2. We categorised such depictions as indexing *Youth labour*. Clearly, it must be the case that the category of *Youth labour* is not mutually exclusive with respect to all of the other categories of work. Children are depicted as participating in *Farming*, *Shopping*, *Trading*, *Housework* and *Environmental work*. We therefore have 19 different categories associated with work. Not all of the categories of work appear in every book, but all are represented across the texts examined. In the Grade 1 text, 8 of 19 categories of work are represented; in Grade 2, 9 are represented; in Grade 3, 13 are represented; and in Grade 4, 14 are represented. We can see from the categories that the universe of work represented in the texts is rather limited in extent and appear to be focused around what the authors imagine might be the knowledge of work held by young children.

Categories of work	MW1	MW2	MW3	MW4	Total	%
Farming	16	3	19	8	46	10.1%
Trading	2	5	10	4	21	4.6%
Retail	1	3	13	3	20	4.4%
Manufacturing	0	0	5	5	10	2.2%
Transport	0	1	3	6	10	2.2%
Generic adult work	0	0	0	1	1	0.2%
Construction	0	0	0	2	2	0.4%
Postal services	0	0	6	0	6	1.3%
Fishing	0	0	1	0	1	0.2%
DIY	0	0	0	1	1	0.2%
School administration	0	4	7	6	17	3.7%
Cottage industry	1	0	22	1	24	5.3%
Environmental work	0	0	0	6	6	1.3%
Health care	0	0	5	0	5	1.1%
Community service	0	0	0	7	7	1.5%
Travel	1	6	9	10	26	5.7%
Shopping	3	4	1	8	16	3.5%
Housework	2	11	12	6	31	6.8%
Youth labour	15	19	7	4	45	9.9%
Total	41	56	120	78	295	

Table 5.4: Quantity of Tasks and Units referencing different categories of work

Table 5.4 presents a summary of the quantity of references to work in the Tasks and Units across the Grades 1 to 4 texts of the *Mathematics at work* series.

Mathematics at work, Grade 4

In the *Mathematics at work, Grade 4* text Modules and Units rather than Tasks are used to organise the contents. Each Module consists of a series of Units which cohere around a central, usually extra-mathematical, theme (a so-called 'programme organiser'). As with the Grades 1 to 3 texts, pictures are also used extensively and occupy much of the available space. Each Unit spans one or more B5 page of, usually, closely-related tasks. Plate 5.3 shows an example of the first page of a Unit. Taking the Unit as the object of analysis we described each Unit in terms of the 19 categories of work referred to earlier, using the same procedure for description and recording as we did when considering the Grades 1 to 3 Tasks.

The results of our categorisations can be recorded in a manner similar to the way we recorded data about the movement of the notion and subject-positions in Section 5.4.3. That is, we list all of the Tasks of a particular text one beneath the other and check each of them for occurrences of any of the categories of work. Where such occurrences are apparent we indicate 1, otherwise 0, in the appropriate row and column for a task and category of work. In that way we generate a matrix consisting of 1s and 0s describing the occurrences of references to different types of work in each of the texts for Grades 1 to 3.

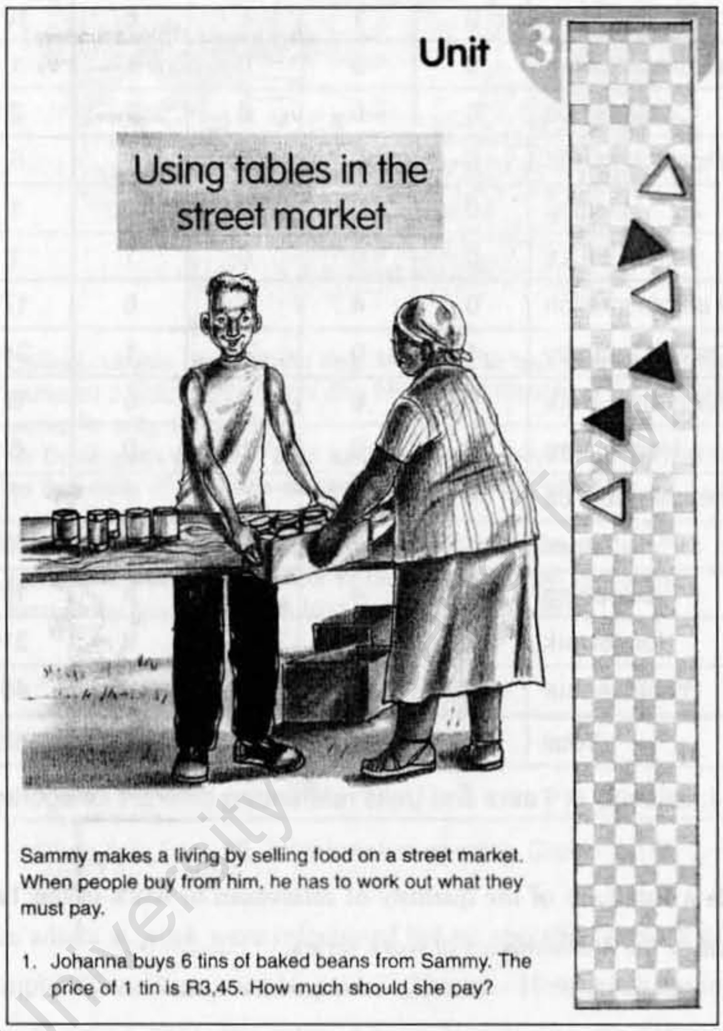


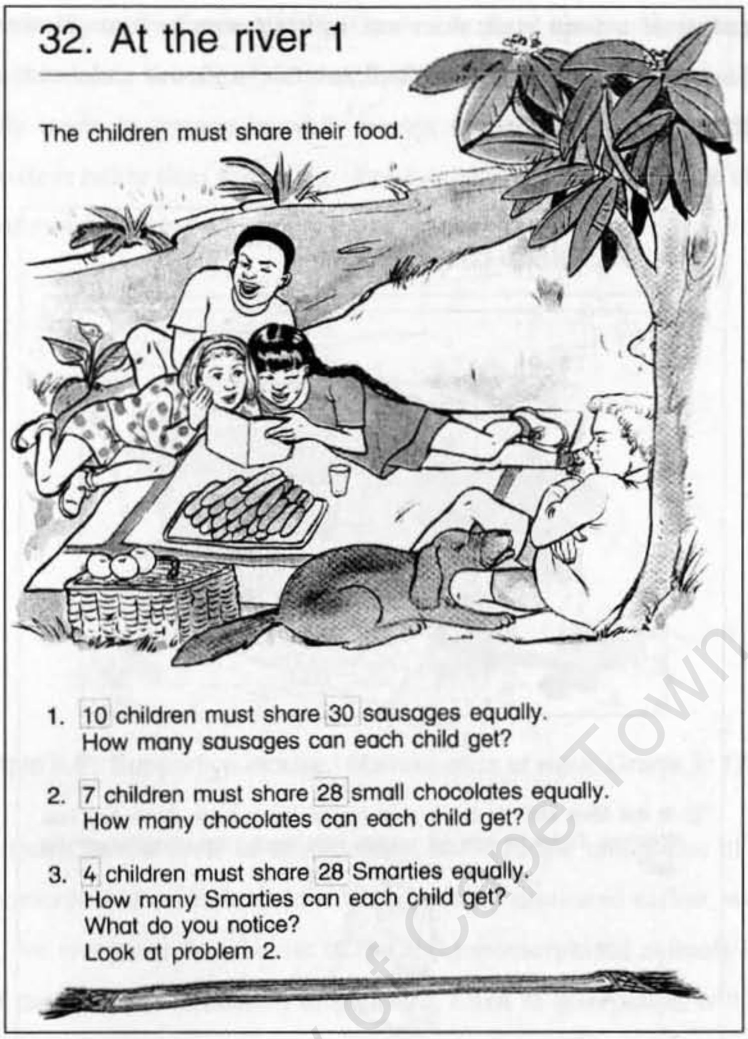
Plate 5.3: Module 8, Unit 3, *Mathematics at work, Grade 4*:137

5.2.4.2 Producing data on references to pleasure

As we indicated earlier, the modalities of references to pleasure used in the Grades 1 to 3 texts differ from those used in Grade 4. We will discuss the former texts first.

Mathematics at work, Grade 1 to *Grade 3*

Pleasure is referenced pictorially and discursively in the Grades 1 to 3 texts. Consider the Task shown in Plate 5.4. The drawing shows children having a picnic on the banks of a river, indicating a recreational activity. Such depictions are considered here as instances of pleasurable child activity and set the extra-mathematical context of the Task.


32. At the river 1

The children must share their food.

1. 10 children must share 30 sausages equally.
How many sausages can each child get?

2. 7 children must share 28 small chocolates equally.
How many chocolates can each child get?

3. 4 children must share 28 Smarties equally.
How many Smarties can each child get?
What do you notice?
Look at problem 2.

Plate 5.4: Task 32, *Mathematics at work, Grade 2*: 52

The three questions listed on the page all refer to food and sweets to be consumed by the children who are, presumably, participating in the picnic. The questions are considered to be instances of discursive references to pleasure. Occasionally Tasks will reference pleasure discursively but not pictorially. Not all references to pleasure are associated exclusively with children. In a few cases Tasks refer to adults or whole families engaged in pleasurable activity, like having a party or taking a holiday trip. We distinguish the references to children's pleasure from the rest by categorising the Tasks in which references to children's pleasure occur as exhibiting instances of *Youth recreation*. For every Task in which they occur all instances of references to pleasure, whether pictorial or discursive, are categorised as *Fun*. It follows that every Task in which significations of *Youth recreation* occur is also categorised as one in which *Fun* occurs. In addition, where pleasure is signified but not associated with children, the Task in which it occurs is categorised as signifying *Fun*. The category *Fun* is therefore richer in extension than that of *Youth recreation*, the latter being a species of *Fun*.

We now consider a more problematic modality of the signification of pleasure used in the Grades 1 to 3 texts. Consider the Task shown in Plate 5.5. The particular extra-mathematical context and activity depicted, trading at a farm stall, does not in itself signify fun. However, in the drawing accompanying the Task we see anthropomorphised animals, a mouse and a cat, engaging in a bit of tomfoolery, so signifying the presence of fun.


21. Apples and eggs

1. At the farm stall Mr Davis sells his apples in bags. Each bag has 8 apples. Today he has 43 apples. How many bags of apples can he sell?

2. Mrs Davis wants to take 34 eggs to her friend, Mrs Williams. She packs all the eggs into egg boxes that take 6 eggs each. How many egg boxes does she need?

Plate 5.5: Task 21, *Mathematics at work, Grade 3*: 34

Here fun comes to be associated with the Task in an oblique way, through the actions of anthropomorphised animals, but the fun being had is not an intrinsic signification of the particular activity depicted in the Task. The insertion of the anthropomorphised animals into the text is therefore a device used to *distort the signification* of a contextualising activity employed in a Task so that fun can conceivably come to be associated with any activity or context. Occasionally objects (a three-legged pot or a three-legged stool, for example) rather than animals are anthropomorphised and made to signify pleasure.

Anthropomorphised mice, and occasionally other animals, are used in a third way in the Grades 1 to 3 texts: to comment on problems, convey information and pose questions to the reader, so that they function in a supportive rather than disruptive manner. The Grade1 text makes use of the mice in this way 7 times; the Grade 2 text, 25 times; and the Grade 3 text, 11 times. However, even with this use of anthropomorphised animals the signification of whimsy is still present because the activities the animals are generally made to engage in while posing questions or conveying information remain associated with recreation rather than schooling. For example, Plate 5.6 shows a skateboarding mouse holding a huge bag of sweets posing a question to the reader.

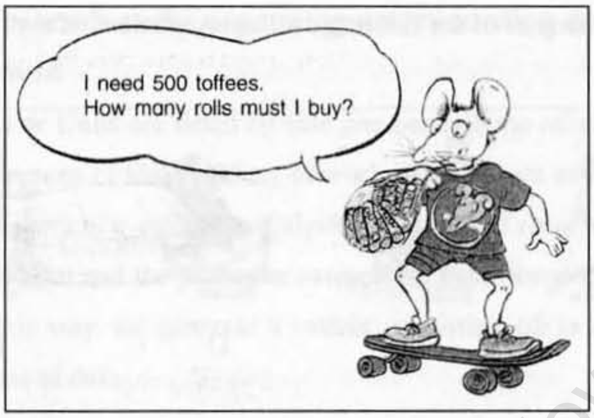


Plate 5.6: 'Supportive mouse,' *Mathematics at work, Grade 2*: 121

In order to distinguish, at the level of terminology, between the modalities of the signification of fun that use anthropomorphised animals and the first modality discussed earlier, we need to settle on a suitable term. First, we recognise that the use of the anthropomorphised animals or inanimate objects is intended to effect the artificial animation of pleasure, often in association with a context in which pleasure does not necessarily inhere. Second, we also recognise that the device of anthropomorphising animals or inanimate objects is itself a means of artificially animating human characteristics in animals and objects. Third, the use of anthropomorphised animals and objects introduces an element of whimsy into the texts, one of the effects of which is the production is a jocose distortion of the text, which might also be considered as an ironic commentary on a context or activity, especially when the depicted activity is serious rather than recreational. A term which suitably captures the elements drawn out here is *pixilation*, which we shall use to refer to the modalities of the signification of pleasure that employs anthropomorphised animals or objects to associate pleasure with activities and/or contexts.

Across the Grades 1 to 3 texts, we find that pixilation is employed in 35% of Grade 1 Tasks, 44.6% of Grade 2 Tasks, and 42.5% of Grade 3 Tasks.

Mathematics at work, Grade 4

In the Grade 4 text we find that only 12.3% of Units (14 of 114) signify pleasure using the first modality discussed above, that is, the signification of pleasure by way of pictorial or discursive representations of fun directly related to the particular contexts and activities referenced.

Almost every Unit of the Grade 4 text (112 of 114, or 98.2% of Units) incorporates the use of anthropomorphised mice, but the representations of the mice are qualitatively different from the mice, other animals and objects that are anthropomorphised in the Grades 1 to 3 texts. The first difference to note, aside from the fact the mice are drawn differently, is that the anthropomorphised mice populating the Grade 4 text are involved in activity directly supportive of the acquirer's involvement with the represented contexts and activities, but that their activity does not constitute an ironising of the text. Plate 5.6 (A to I) shows examples of the full range of representations of the mice in the Grade 4 text.

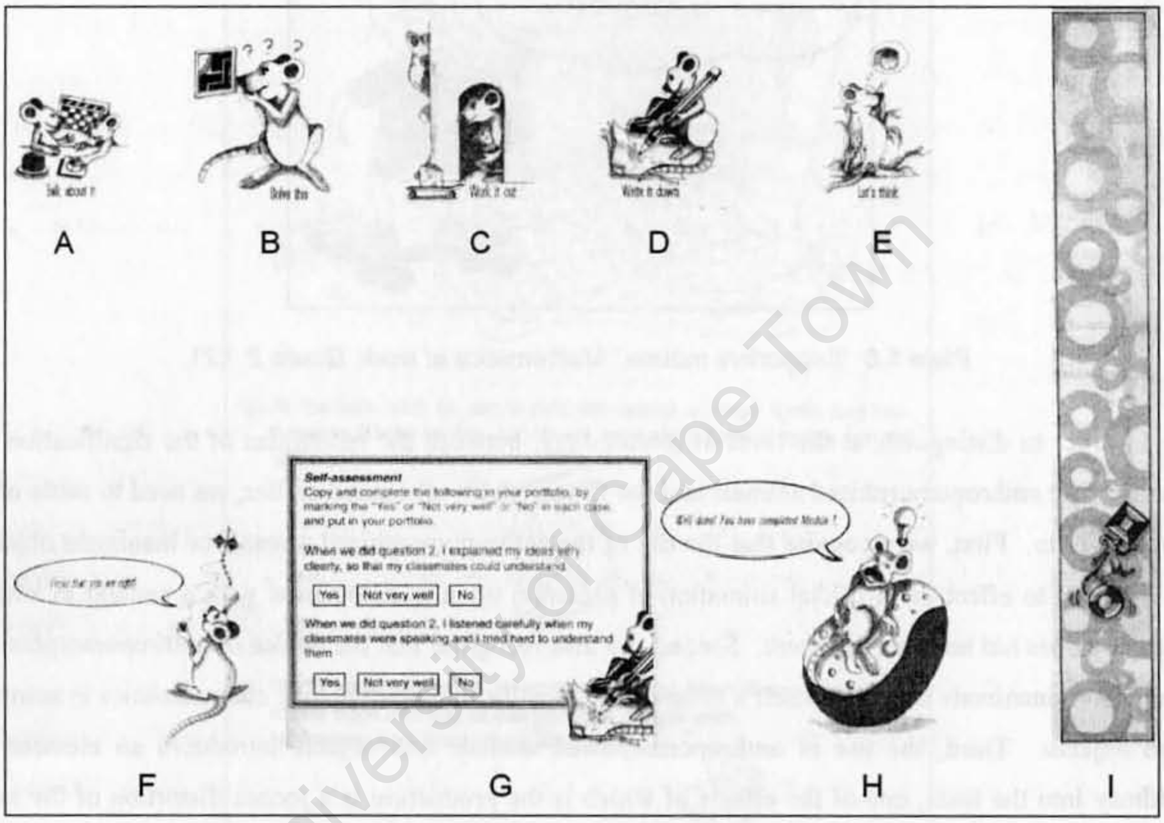


Plate 5.7 (A to I): The uses of mice in *Mathematics at work, Grade 4*

Strips of the type shown in Plate 5.7 (I) appear on the odd-numbered pages of the text and often show a mouse at play, from which it might be argued that such illustrations should be categorised as instances of pixilation. Such categorisation is considered unreasonable for at least three reasons. First, the strip illustrations are independent of the content the reader is required to engage with and can not in any obvious way be read as a commentary on that content. Second, the regularity of appearance of the strips (on the odd-numbered pages of the text) might well have the effect of encouraging a reading of the strips as purely decorative. Third, the absence of representations of disruptive mouse behaviour coupled with the extensive use of mice (in 98.2% of Units) to communicate instructions to the reader—"Talk about it," "Solve this," "Work it out," "Write it down," "Let's think," "Prove that you are right"—and to affirm the reader—"Well done! ..."—align the mice with supportive rather than transgressive behaviour. The element of naughtiness that was semiotically attached to the mice in the Grades 1 to 3 texts is absent from the Grade 4 text. In other words, the mice are used to regulate the activity of the reader just as the ideal PCA teacher might do, and the inevitable associations of the anthropomorphised mice with play and fantasy—and therefore pleasure—come to be tied to the recognition and realisation of correct acquirer behaviour. We shall refer to this modality of the signification of pleasure as *ideal fun.*

5.2.5 Summary of the procedure for producing and recording data on the signification of work and pleasure

For each text all the Tasks or Units are listed by title one beneath the other. Each Task or Unit of a text is examined for occurrences of the signifiers of work and pleasure as described in Section 5.2.4. For every occurrence of a particular category of signification a 1 is recorded in the row and column associated with the Task or Unit and the particular category of signification, otherwise a 0 is recorded. As described before, in this way we generate a matrix consisting of 1s and 0s which serves as a description of a text in terms of data.

5.3 Additional categories used in the production of data

Five additional categories are used in the production of data, the reasons for which are indicated in the descriptions below. The first three additional categories cover those Tasks and Units referencing the everyday but which cannot be easily associated with either utility or pleasure. The last two additional categories are of a different order. As before, where a particular Task or Unit can be categorised in terms of one or more of the five categories listed below a 1 is recorded in the appropriate row and column, otherwise a 0 is recorded. The five categories are as follows:

(1) *Objects (natural and/or manufactured).* There are Tasks or Units focused on the description of particular objects, like sea shells, for example, without referencing a particular context or activity.

(2) *Time.* Many Tasks and Units engage the reader with problems related to the reading of watches or clocks or calculating spans of time. Often, but not always, the Tasks or Units refer to no context or activity outside of the particular time calculations.

(3) *Money.* Similar to the case of *time*, a number of Tasks and Units require the reader to perform calculations on money, not always associated with contexts or activities outside of the calculations on money.

(4) *Family.* Occasionally Tasks or Units would use some or other family activity as a context, like a family holiday, for example. The chief reason for including this category was to measure the extent to which pleasure becomes explicitly associated with the family as a socialising mechanism.

(5) *Mathematising the body.* A number Tasks and Units include problems requiring the reader to

either describe features of their bodies in mathematical terms or use there bodies as representative of a mathematical idea, or both.

5.4 Summary

In this Chapter we have demonstrated how the splitting produced by pedagogic judgement at the moment of immediacy are to be recognised at (1) the level of the notion to be acquired and (2) at the level of the relation between transmission- and acquisition-functions. The latter is recognised in terms of subject-positions that distribute the location of knowledge and ignorance.

In Chapter 3 we argued that pedagogic judgement also produces a split between the subjects of the enunciated (statement) and the subject of the enunciation, where the latter is presumed to mark the place from which the enunciated is produced. The subject of the enunciation is in turn split into two modalities of identification: the ideal ego and the ego-ideal; the former is the ego in imaginary identification, and the latter, in symbolic identification. The regulative discourse has as its primary target the subject of the enunciation which it attempts to shift from imaginary to symbolic identification. To that end, regulative discourse, through pedagogic judgement, starts by locating the pedagogic subject in the Imaginary, which in contemporary South African mathematics education in schooling is aligned with the everyday. Hence the so-called contextualisation of mathematical tasks in the "real world" of the student. Further, the general utilitarian moral regulation privileged by the pedagogic discourse announces a coincidence of the utility of knowledge and the pleasure of the pedagogic subject. In order to describe the manner in which pedagogic discourse meets the demands of the moral order we are obliged to describe pedagogic judgement in terms of the references to utility and pleasure. Utility is captured in categories of labour displayed in the narratives that accompany mathematics tasks. Pleasure is captured in categories displayed by way of reference to various forms of recreation in the narratives and also in the depicted behaviour of fantastical characters (anthropomorphised creatures and everyday objects). Pleasure itself is described in three ways: as *fun*, *pixilation* and *ideal fun*. The relations between the different modalities of pleasure enable us to describe the central mechanism through which identification is shifted from the Imaginary to the Symbolic, which we discuss in detail in the next Chapter.

Chapter 6

An encounter with the Imaginary and the Symbolic: the universe according to *Mathematics at work*

We open this Chapter with the central proposition to be established here: the *Mathematics at work* series of school mathematics textbooks promotes a pedagogic modality that attempts to use the acquirer's image of themselves, refracted through the utilitarian pedagogic lens of "relevance," to effect the reproduction of school mathematics. Stated differently, rather than aim directly at the Symbolic, *Mathematics at work* texts appeal to the pleasure principle to provoke a descent into the Imaginary in order to hook the acquirer into the Symbolic, hoping in that way to avoid an encounter with the Real of the *jouissance* of the pedagogic subject. The authors of the *Mathematics at work* series, in a common preface to each of the Grades 1 to 3 texts, explain their use of images in plainer terms: "The illustrations play a very important part in this book. They are not only attractive, but are frequently used to explain a situation to the young non-reader, and even to pose the problem itself." (Murray, Human & Olivier, 1997: no page number) We can add that the illustrations are a central textual resource for the establishment of the diegetic space of the texts.

Since, in Freudian and Lacanian terms, the clearest indication of the presence of the Imaginary is the subject's fixated fascination with the mirror image we shall focus much of the ensuing discussion around the construction of the images that constitute the textual universe of the *Mathematics at work* texts. We start by considering the general features of the texts and then discuss the specificities of the mechanisms used to draw the acquirer through the Imaginary into the Symbolic.

6.1 General features of texts in the *Mathematics at work* series

In the previous Chapters various features of the *Mathematics at work* texts have already been described where it was appropriate to do so. Our object in this Section is to provide a comprehensive description of the organisation of the texts before moving on to more detailed discussion and analyses.

6.1.1 The Grade 1, 2 and 3 texts

Dedication

Each of the Grades 1 to 3 texts open with the dedication shown in Plate 6.1, offered by an anthropomorphised mouse. But who, other than the authors of the texts, is in a position to offer such a dedication? The mice are, then, in terms of the dedication, representing the authors. Notice that the dedication positions the mice as acquirers, as those who have apparently been taught much by children. Further, the authorial voice of a pedagogic text is typically aligned with the teacher who is intended to use the text as a teaching resource. We therefore have the mice identified with the authors who are in turn identified with the teacher, in that way identifying the mice with teachers and positioning the latter as acquirers. Children, with whom the intended student readers are expected to identify, are positioned as transmitters, as though they have been doing the teaching. So, right from the start we have the construction of a topsy-turvy world in which—or apparently so—students are aligned with a transmission-function and teachers with an acquisition-function.

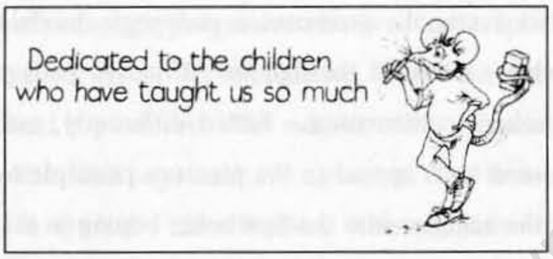


Plate 6.1: The dedication in the Grades 1 to 3 *Mathematics at work* texts

It may, however, be claimed that the dedication merely reveals that the authors, having learnt much from their observations and studies of students learning mathematics, are thankful for having had the opportunity to do so. This second reading must certainly be correct given the extensive professional and research activity of the authors which *is* focused on studying the acquisition of school mathematics. But why phrase the dedication in that particular way? Let us consider what is at stake here. If children, as objects of research and professional contemplation have "taught," then they must have achieved that feat of teaching in a passive manner; that is, without intending to do so and without awareness of the knowledge being "taught." To claim otherwise would be to assert that children are already in possession of the knowledge academic researchers are attempting to produce and, consequently, that researchers merely reproduce rather than produce knowledge. In other words, implicit in the dedication is the operation of a proposition claiming that it is possible to teach without actively doing so. It is the operation of this implicit proposition that produces the form of the dedication. What we are drawing attention to here is the operation of two textual levels: the first is concerned with the subject of that which is enunciated (of the dedication, for example); the second is concerned with the subject who has produced the enunciation (the position from which the dedication has been produced). The second level is expressed in the form taken by the first. We shall return to this point later, after the major features of the texts have been described.

We saw earlier that the form of the dedication produces a chain of identities: mouse $\equiv$ author $\equiv$ teacher; student $\equiv$ transmitter; (author $\equiv$ acquirer) $\Rightarrow$ (teacher $\equiv$ acquirer); and, if the student is a transmitter, then transmission takes a passive form. But this is nothing other than constructing the model student in a way that mirrors the current construction of the model teacher as a "facilitator" in current official pedagogic discourse. Therefore, right from the start of the *Mathematics at work* texts, even before actual mathematics contents are dealt with, we encounter the structuring effects of the regulative discourse on a seemingly innocent declaration of appreciation addressed to children.

"Getting to know you"

Another feature of the Grades 1 to 3 texts is the introduction of the reader to the textual characters who populate the texts before encountering the Tasks. In the "Getting to know you" sections of the texts the reader is presented with images with which to identify. The rest of each of the texts will reveal to the reader a tightly circumscribed, localised world which constitutes the "relevant" context for the elaboration of mathematics.

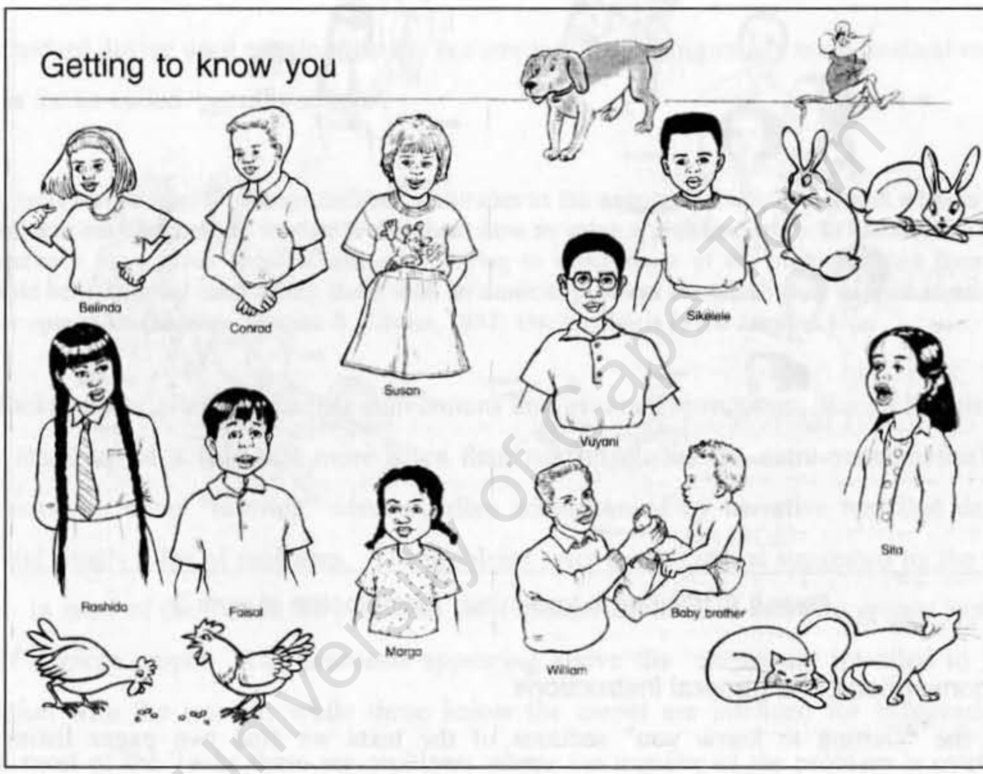


Plate 6.2: "Getting to know you," Grades 1 and 2 of *Mathematics at work*

Plates 6.2 (Grades 1 and 2) and 6.3 (Grade 3) show the "Getting to know you" introductions to the textual characters. The immediate differences between the two versions are the absence of adults from the "Getting to know you" introductions of the Grade 1 and 2 texts and the arrangement of the textual characters into family units in the Grade 3 text. The mouse, who appears in both versions of "Getting to know you," stares off into the distance in the Grade 1 and 2 texts, apparently not too concerned about the introductions taking place. In the Grade 3 text the mouse appears to be more attentive to the introductions.

Notice that the form of the title of the section, "Getting to know you," suggests an animation of the text itself, producing an effect of the textual characters confronting the reader as vital. The section could have been titled "Getting to know the characters," or something along such lines, but then the text and characters remain objectified. It would seem that the intended effect of the form of the title is a minimisation of the distance between the actual social context of the reader and the diegetic space of the text. If, as we are proposing, the general strategy at work is to hook the acquirer through the Imaginary into the Symbolic, then we would hope to see at work textual strategies that encourage Imaginary identifications on the one hand, and others that negate those identifications and attempt to establish Symbolic identifications in their stead.

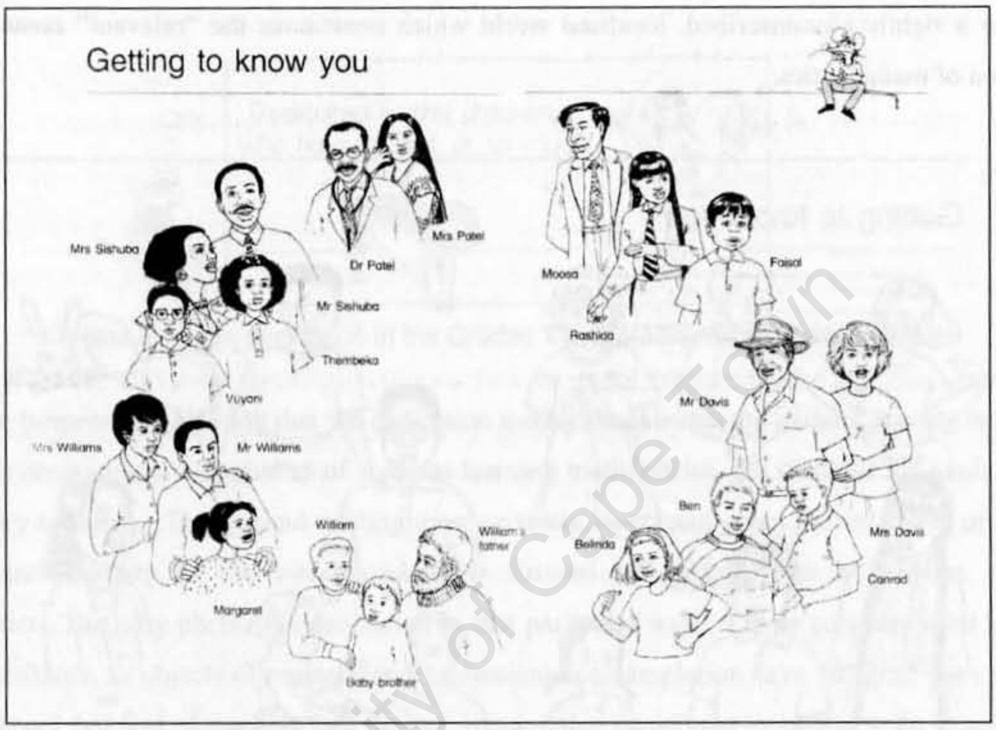


Plate 6.3: "Getting to know you," *Mathematics at work 3*

Reading conventions and general instructions

Following the "Getting to know you" sections of the texts we find two pages listing reading conventions and general instructions to the reader. At the end of the second page in this section of the texts the mouse instructs the reader to turn to the back of the book where s/he will find representations of two empty picture frames in which s/he is to draw two self-portraits: one at the start of the school year and the other at its conclusion. The final words of the mouse in this section are (of course!) the injunction: "Have fun!" The pages to which the mouse refers contain spaces for information to be filled in by the reader (names, birth date, parent's names) as well as a table which is to be completed on the first day of every term (date, height, mass). So, along with the images presented to the reader s/he is required to insert a self-image into the text, in that way entering the diegetic space of the text and becoming a textual character.

The lists of contents and the Tasks

The contents pages of the Grades 1 to 3 texts show lists of Task titles, most of which have extra-mathematical referents (for example, "Animals," "Sweets," "In the garden" and so forth) from which it is impossible to decide what the mathematics contents of those Tasks might be. This, according to the authors, is part of a considered pedagogic strategy that withholds mathematical referents from the student. The reason they give for doing so is that the student is likely to suspend reflective thought and use whichever mathematical operations are immediately suggested by the presence of mathematical signifiers.

A pupil's question like "*Is it a divide?*" is a serious danger sign with respect to the pupil's attitude towards problem solving and learning — it usually indicates that the pupil is not intent on understanding the problem or trying to solve it independently. [...] In no circumstances should the teacher answer the pupil's question by suggesting an operation. (Human, Olivier, Murray, Du Toit, 1993: viii; italics in the original.)

The standard device used to minimise the occurrence of unambiguously mathematical referents in a problem is the so-called "word problem".

Word problems can be used to change children's attitudes to the **nature** of mathematics and **what is expected of them**. Children may expect the teacher to tell them how to solve a problem or try to identify the operation or number sentence for a given problem instead of trying to make sense of the problem. Jolt them out of this unacceptable behaviour by confronting them with an unusual problem for which they **cannot** identify a number sentence or operation. (Murray, Human & Olivier, 1997: xix; emphasis in the original.)

The Tasks appear after the reading conventions and general instructions. Recall that the Tasks are typically made up of a title that more often than not references the extra-mathematical, a picture showing some or other "relevant" context, often accompanied by narrative text that describes the context, and finally a list of problems. The problems refer to the context suggested by the picture and narrative. In most of the Tasks, the problems they contain are divided into two groups separated by a picture of a green carpet. The problems appearing above the carpet are intended to be done in collaboration with the teacher, while those below the carpet are intended for independent student work. In most of the Tasks there are problems where the number of the problem is overlaid with a green circle. Problems marked in that way are compulsory. The Tasks, which usually extend over one or two A4 pages, are populated by one or more of the textual characters introduced in the "Getting to know you" section, along with anthropomorphised animals and/or objects, and/or realistic images of objects and animals (not anthropomorphised).

"The world we live in"

The final sections of the texts are titled "The world we live in." Plates 6.4 and 6.5 show the images appearing on the section dividers of "The world we live in" sections of the Grades 1 and 2, and Grade 3 texts, respectively. These sections contain tasks that require the reader to situate themselves in time, space and culture. It is evident from tasks listed in Table 6.1 that "the world we live in" is restricted to very localised place, time and social relations. In addition to the tasks two family trees are provided, one of a family of mice and the other of a human family.

Plate 6.4: "The world we live in", Grades 1 and 2

Plate 6.5: "The world we live in", Grade 3

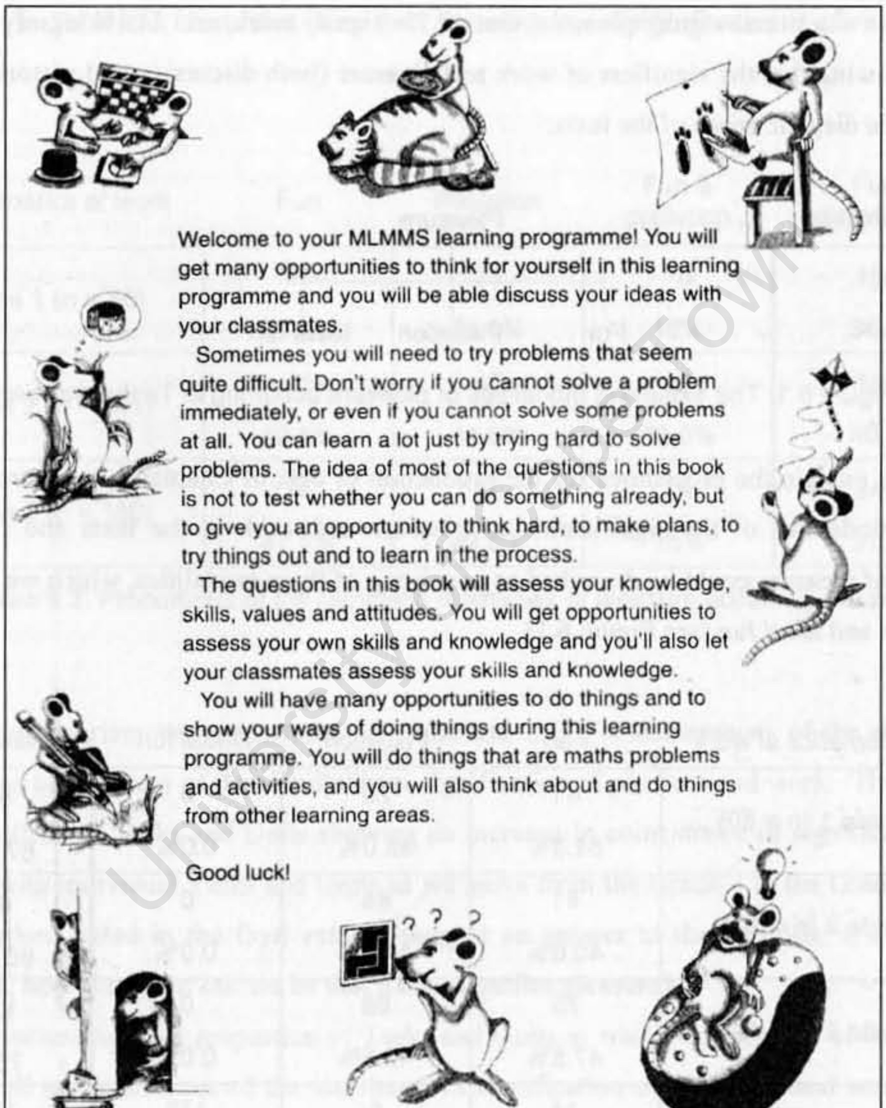
The world we live in, Grade 1 and 2	The world we live in, Grade 3
1. A year [refers to seasons and rainfall patterns]	1. Special days [refers to religious festivals]
2. A week [refers to family activity on each of the days of the week]	2. Where are we? [refers to a map of Southern Africa and a globe map]
3. A day [refers to times at which different everyday activities take place]	3. My family and friends [refers to the family trees and ages of friends]
4. Special days [refers to religious festivals]	4. My school [refers to a description of the reader's school]
5. My family and friends [refers to the family trees and ages of friends]	5. Myself [self-portraits]
6. Myself [self-portraits]	6. Where does the wind come from? [refers to a map of Southern Africa, wind direction and cardinal points]
7. Where are we? [refers to a map of Southern Africa and a globe map]	
8. Flags [refers to flags of a few Southern African states as well as to those of the US and UK]	
9. My school [refers to a description of the reader's school]	
10. Patterns [refers to decorative features in architecture and woven objects]	

Table 6.1: Tasks making up "The world we live in" section of the Grades 1, 2 and 3 texts

The final page of the each of the Grade 1 and 2 texts has printed on it a board for playing a snake-and-ladders-type game—the fun inevitably finds the acquirer!

6.1.2 The Grade 4 text

The Grade 4 text shares many of the features of the Grades 1 to 3 texts: extensive reference to the everyday, the use of anthropomorphised animals, the use of "word problems" and the minimisation of the use of unambiguously mathematical signifiers in the presentation of problems. Unlike as is the case of the other texts, the introductory material to the Grade 4 text is very brief, simply informing the reader of what to expect and what they are expected to do. Other than the mice, none of the other textual characters are introduced. Plate 6.6 shows a reproduction of the Grade 4 introductory material.



Welcome to your MLMMS learning programme! You will get many opportunities to think for yourself in this learning programme and you will be able discuss your ideas with your classmates.

Sometimes you will need to try problems that seem quite difficult. Don't worry if you cannot solve a problem immediately, or even if you cannot solve some problems at all. You can learn a lot just by trying hard to solve problems. The idea of most of the questions in this book is not to test whether you can do something already, but to give you an opportunity to think hard, to make plans, to try things out and to learn in the process.

The questions in this book will assess your knowledge, skills, values and attitudes. You will get opportunities to assess your own skills and knowledge and you'll also let your classmates assess your skills and knowledge.

You will have many opportunities to do things and to show your ways of doing things during this learning programme. You will do things that are maths problems and activities, and you will also think about and do things from other learning areas.

Good luck!

Plate 6.6: *Mathematics at work 4*, introductory material

The content of the text is organised into twelve Modules each of which are made up of a number of Units. Each Module is organised around a "programme organiser," announced in the Module title, which usually signifies an extra-mathematical context; three of the twelve Modules have titles/"programme organisers" that, arguably, signify mathematics: "Pieces of mathematical history," "Measurement" and "Mathematical investigations." The other Modules have titles/"programme organisers" like "Comparing houses" and "Shopping and saving," indicating the presence and extensive use of extra-mathematical referents.

6.1.3 Pleasure and work

Every Task and Unit, including every problem within Tasks and Units, in the Grades 1 to 4 *Mathematics at work* texts was analysed using the data production procedures discussed in Chapter 5. Recall that in Chapter 2 it was announced that 77.6% of all the Tasks and Units (Grades 1 to 4) of the *Mathematics at work* texts signify pleasure, that 45.7% signify work, and 34.1% signify both pleasure and work, showing that the signifiers of work and pleasure (both discursive and pictorial) are central elements of the diegetic space of the texts.

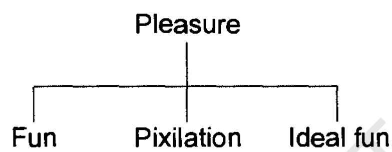


Figure 6.1: The signifying modalities of pleasure occurring in Tasks and Units

In order to explain the procedures for the production of data in Chapter 5, we were compelled to discuss the modalities of the signification of pleasure and work in the texts and found that the signification of pleasure could be described as consisting of three modalities, which we referred to as: *fun*, *pixilation* and *ideal fun* (see Figure 6.1).

Mathematics at work	Fun	Pixilation	Ideal fun	Pleasure
Grade 1 (n = 80)	41 51.3%	28 35.0%	0 0.0%	54 67.5%
Grade 2 (n = 101)	41 40.6%	45 44.6%	0 0.0%	67 66.3%
Grade 3 (n = 160)	76 47.5%	68 42.5%	0 0.0%	120 75%
Grade 4 (n = 114)	14 12.3%	0 0.0%	112 98.2%	112 98.2%

Table 6.2: Proportions of the signifying modalities of pleasure occurring in Tasks and Units

When a Tasks or Unit is recognised as signifying pleasure it is counted only once, irrespective of the number of modalities of pleasure that occur. The final column in Table 6.2, titled "Pleasure," indicates the proportion of Tasks and Units signifying pleasure.

Table 6.3 shows the proportion of Tasks in the Grade 1 to 3 texts in which both fun and pixilation occur simultaneously. The last column shows the extent to which the signification of fun is accompanied by pixilation. In Chapter 5 we argued that pixilation, while signifying pleasure, is nevertheless a disruptive form of pleasure and hence produces an ironising of the text. So, when fun and pixilation occur simultaneously we read the presence of pixilation as an ironic commentary on the signification of fun. In other words, the presence of pixilation in Tasks indicates moments of negation of fun. We will elaborate on the function of such negation in greater detail later.

The proportion of Tasks and Units in which the different modalities of signifying pleasure are used is summarised in Table 6.2. Note that more than one modality of signification is often employed in a Task or Unit.

Mathematics at work	Fun	Pixilation	Fun & pixilation	Fun & pixilation/fun
Grade 1 (n = 80)	41 51.3%	28 35.0%	15 18%	15/41 36.6%
Grade 2 (n = 101)	41 40.6%	45 44.6%	19 18.8%	19/41 46.3%
Grade 3 (n = 160)	76 47.5%	68 42.5%	24 15%	24/76 31.8%

Table 6.3: Proportions of the signifying modalities of pleasure occurring in Tasks

Table 6.4 summarises the proportions of Tasks and Units of occurrences of the signification of work as well as occurrences of the simultaneous signification of pleasure and work. The final column lists the proportion of Tasks and Units showing an increase in coincidence of significations of work and pleasure with individual Tasks and Units as we move from the Grade 1 to the Grade 4 text. That is, the proportions listed in the final column suggest an answer to the question: if a Task or Unit signifies work, how confident can we be that it also signifies pleasure?

Table 6.5 summarises the proportion of Tasks and Units in which occurrences of the signification of work as well as occurrences of the simultaneous signification of pixilation and work are present. The final column lists the proportion of Tasks and Units for which the signification of work is accompanied by pixilation. That is, if a Task or Unit signifies work, to what extent is that signification disrupted by pixilation? Recall that the presence of pixilation indicates an ironising of the text, specifically an ironising of the signification of work in this instance.

Mathematics at work	Work	Pleasure & work	Pleasure & work/work
Grade 1 (n = 80)	24 30%	11 13.8%	11/24 45.8%
Grade 2 (n = 101)	34 33.7%	18 17.8%	18/34 52.9%
Grade 3 (n = 160)	94 58.8%	71 44.4%	71/94 75.5%
Grade 4 (n = 114)	56 49.1%	55 48.2%	55/56 98.2%

Table 6.4: Proportions of the Tasks and Units signifying work, and both pleasure and work

An examination of the proportion of significations of work pixilated reveals a significant increase from the Grade 1 to the Grade 3 texts, which is interesting. We shall return to this later when discussing the function of pixilation in the negation of Imaginary identification.

Mathematics at work	Work	Pixilation & work	Pixilation & work/work
Grade 1 (n = 80)	24 30%	4 5.0%	4/24 16.7%
Grade 2 (n = 101)	34 33.7%	10 9.9%	10/34 29.4%
Grade 3 (n = 160)	94 58.8%	34 21.3%	34/94 36.2%
Grade 4 (n = 114)	56 49.1%	0 0.0%	0/56 0.0%

Table 6.5: Proportions of the Tasks and Units signifying work, and both pixilation and work

6.1.4 Mathematising the body

In Chapter 5 we reported that a number of Tasks and Units engaged the reader with problems to be solved by describing parts of their bodies in mathematical terms or by using parts of their bodies as representative of a mathematical idea, or both. We referred to those Tasks and Units as *mathematising the body*. Table 6.4 provides a summary of the proportion of Tasks and Units that do so. From Table 6.6 it is immediately apparent that the mathematising of the body steadily decreases as we move across the texts from Grade 1 to Grade 4.

	Mathematics at work			
	Grade 1 (n = 80)	Grade 2 (n = 101)	Grade 3 (n = 160)	Grade 4 (n = 114)
Total	45	30	9	5
%	56.3%	29.7%	5.6%	4.4%

Table 6.6: Proportions of Tasks and Units mathematising the body

6.2 The functioning of the diegetic space in the constitution of the Imaginary

From the descriptions of the diegetic space of the texts in Section 6.1 it becomes apparent that a host of textual strategies are at work in the *Mathematics at work* texts that attempt to weaken the boundary between the social milieu of the acquirer and the diegetic space of the text: the textual characters introduce themselves to the acquirer, inviting him/her into the world of the text; acquirers are requested to insert images (discursive and pictorial) of themselves into the text, so becoming textual character themselves; the mathematical contents of Tasks and Units are rendered in everyday terms and embedded in extra-mathematical contexts that the acquirer is expected to be familiar with and hence, expected to identify with; the textual characters indulge in a variety of commonplace pleasurable juvenile activities (picnics, parties, outings, holidays, sport, play, the consumption of sweets and fast foods); the body of the acquirer is used both as an object on which signifiers of mathematics are inscribed and as a stand-in for mathematics contents, suggesting that the body of the acquirer is already a mathematical entity and, more generally, that the diegetic space of the texts and, therefore, the social milieu of the acquirer, are in-themselves already mathematical. The texts thereby construct a complex of images that is to be taken as the mirror image of the acquirer in his/her social milieu.

Interestingly the Tasks of the Grade 1 and 2 texts reference adults very sparingly. Save for only 7 of the 80 Tasks in the Grade 1 text (8.8% of Tasks) and 14 of 101 Tasks in the Grade 2 text (13.7%), children are shown in interaction only with other children, the environment and animals. The Grade text has 88 of 160 Tasks referencing adults (55%) and the Grade 4 text, 55 of 144 Units (48.2%). The minimisation of the inclusion of adults in the diegetic space of the Grade 1 and 2 texts appears to be a deliberate strategy employed by the authors and is informed by their suspicion of the constraining effect of the presence of significant adult others on the thought of young children. Children, so the argument goes, are less likely to think reflectively about a situation when adults are present and will instead revert to established patterns of behaviour learnt from interacting with dominant adults. The point can be made in Piagetian terms: in everyday social settings the activity of children tends to be accepting of gerontocratic organisations of the social, and children's behaviour and thought would therefore be sociocentric (that is, ideological) rather than rational (cf. Piaget, 1990). Here, right from the start of the *Mathematics at work* series, we see the cracks appearing in the Imaginary edifice—the

Imaginary, which is itself a distortion, is in turn distorted in the interests of Symbolic identification.

The mirror image of the acquirer does, however, have to be structured by both utilitarian moral regulation and mathematical rationality, as we saw when considering the contents of the distributive and recontextualising rules of the pedagogic device. In Section 6.1 we saw that extensive use was made of significations of pleasure (in 77.6% of Tasks and Units) and work (in 45.7% of Tasks and Units) in the *Mathematics at work* texts, from which the operation of utilitarian moral regulation can be recognised, the utilitarian being convinced that utility and happiness coincide and, if pursued, produce the greatest good for the greatest number of individuals. In addition, we also saw that as we move across the texts from Grade 1 to Grade 4 that the coincidence of significations of pleasure and work increases dramatically (from 45.8% of Tasks in Grade 1 to 98.2% of Units in Grade 4—see Table 6.4).

The structuring of the mirror image of the acquirer by a mathematical rationality is evident in the distortions of the everyday in the Tasks. Consider, for example, Task 16 of the Grade 1 text that was discussed in some detail in Chapter 5. There two children were required to share three chocolate bars: "Susan and Sita have 3 chocolate bars. How can they share the chocolate equally? Draw your answer." The pictorial text shows one of the children holding up a knife, suggesting to the acquirer that all of the chocolate bars *have* to be shared out, in that way attempting to remove from consideration all other solutions that might be perfectly valid in an everyday setting: like letting each child have one bar and saving the remaining bar, for example. The text has to produce such distortions because otherwise the mathematical point of the Task—establishing a ground for the notion of *half*—will be rendered even more obscure to the acquirer. Another example can be found in the Grade 4 Unit, "Comparing houses," which was discussed in detail in Chapter 4. There, in order to establish the ground for the notion of a two-dimensional unit of measurement and the notion of area, the two houses being compared were each supplied with floors tiled with square tiles of exactly the same size. The acquirer could then use a tile as a unit to measure and compare the houses. Other considerations that might reasonably accompany comparisons of properties in arriving at a decision to move house, like cost, the geographical and social class locations of property, and aesthetics, were suppressed.

Finally, we should mention the use of the acquirer's body in the constitution of Imaginary identifications. Interest in the mathematising of the body stems from the recognition that it occupies two positions in pedagogic discourse: on the one hand, the body is a resource for the production of Imaginary and Symbolic identifications and, on the other, it is a point of resistance to the Imaginary and the Symbolic. When we refer to the body as a point of resistance we are attending to its functioning by means of the drive, meaning that it operates as an obstacle to the pedagogising of the acquirer in the sense that the drive is independent of the moral law, the "drive couldn't care less about prohibition. ... The drive never comes to an impasse" (Miller, 1996: 425-6). The texts make extensive pictorial use of representations of the bodies of children, showing children like the acquirer engaged in extra-mathematical and mathematical activities, in that way attempting to provoke Imaginary identification. However, it becomes difficult to discuss the body solely with respect to the Imaginary when analysing the texts because mathematical significations associated with the body are of the order of the Symbolic rather than the Imaginary. We elaborate on the last point in the next Section.

6.3 From Imaginary to Symbolic identification

The discussion in Section 6.2 arrived at a point where the insistence of the Symbolic could no longer be resisted, and if we look back over that discussion we can detect points at which the Symbolic begins to irrupt from within the Imaginary: just as an image is presented in order to provoke Imaginary identification, the functioning of mathematical rationality produces distortions of the extra-mathematical in the interests of Symbolic identification. In order to establish the point more rigorously we will now present analyses of a selection of Tasks, the intention of which is to demonstrate how the Symbolic hooks onto the Imaginary.

The particular selection of Tasks discussed here is informed by the organisation of the Tasks as described by the authors in teacher's guides that accompany each of the textbooks. The authors are careful to emphasise in the teacher's guides that the sequencing of Tasks in the textbooks is the result of thoughtful and principled planning (e.g., Murray *et al.*, 1997b: xxvii):

> Follow the 80 basic tasks as they come: **the sequence has been very carefully planned**. If a teacher dips into the textbook and chooses a task at random, there is a risk of posing a problem that children have not been prepared for or leaving out tasks that help children develop full understanding of essential concepts. All the tasks and numbers in the tasks have been chosen intentionally for a particular purpose. Even routine tasks are designed to be tackled at a particular stage.

In their commentary on each of the Tasks the authors cluster Tasks in developmental sequences. Each particular clustered developmental sequence falls under a distinct heading. The key ideas associated with each clustered sequence of Tasks are indicated in a shaded box and expressed in mathematical terms rather than in everyday terms as is the case with the actual Tasks in the textbooks. Each of the sequences of Tasks associated with the development of a particular mathematical idea are organised in same general manner: an initial Task introduces the particular mathematical idea by attempting to establish an extra-mathematical ground for it, and then subsequent Tasks develop features of the idea, again through an embedding of mathematics in the everyday, in order to generate a range of predicates that are presumed to fill out the idea.

Given the very stable organisation of sequences of Tasks dedicated to the production of the various mathematical ideas prescribed at the different grade levels we could reasonably select any such sequences at random for analysis. Our interest at this point is to demonstrate how it is that the regulative is attached to the instructional and also to draw attention to very particular features of the regulative within the elaboration of the instructional. To that end we analyse and discuss two particular sequences and two individual Tasks in the following three sub-sections.

6.3.1 Tasks 1, 2 and 3 of *Mathematics at work 1*

Tasks 1, 2 and 3 of *Mathematics at work 1* are indicated by the authors as developing the notion of counting. In the teacher's guides to the Grade 1 and 2 texts the authors suggest that the body is an important resource is establishing the foundations for mathematics:

> Counting forms the basis of all computation. Children must learn to **count out** objects correctly. Reciting the numbers 1, 2, 3, … does not prove that a child can count or can count off objects correctly. When children learn to count, they must count objects **which are the same** and **belong together**. It is best to start with the child's own body (nose, eyes, fingers, etc.) Then go on to well-known objects. (Murray, Human & Olivier, 1997: 1; emphases in the original.)

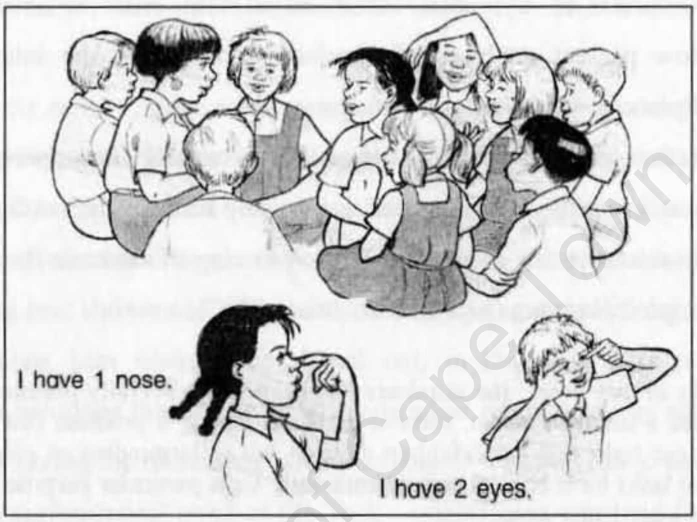


Plate 6.7: Pictorial setting for Task 1 of *Mathematics at work 1*

The first task we encounter in the Grade 1 text, "With my teacher," shows a group of textual characters, two of whom model what it is that the acquirer should do in response to the depicted context (see Plate 6.7).

The textual characters take the position of the ideal-ego of the acquirer; the latter is required to emulate the activity of the former. The task presents the acquirer with the elementary means to mathematise the body. The movement is from knowledge of the body to knowledge of counting.

The split internal to the acquirer is between knowledge of the number sequence as a rhyme (recitation) and ignorance of counting proper (which is concerned with the enumeration of aggregates constituted by a category/set). The aim of the task is to begin to link the recitation of numbers to the enumeration of the elements of a set so that the ground for counting is established. The body of the acquirer serves as the vehicle for generating sets (body parts: nose, eyes, …) which are then enumerated. The particular body parts are, mostly, not specified: all items are of the form "I have *x* …" or "My hand has …," in that way attempting to force on the acquirer the recognition of a category/set (body part) as a necessary element of counting. In other words, in order to produce a legitimate utterance the acquirer is forced select a category/set. Existence of both (1) the sequence of numbers and (2) the body are submitted to reflection to constitute the necessary elements of counting.

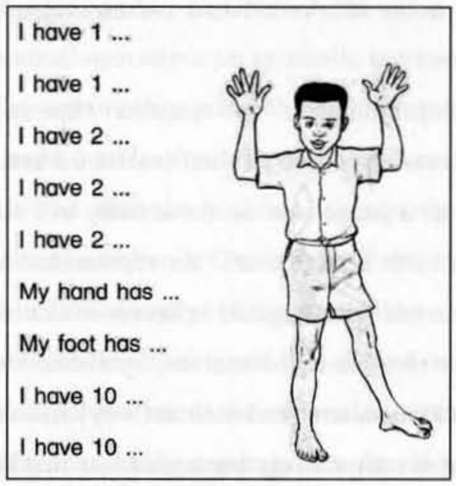


Plate 6.8: The problems and accompanying picture of Task 1 of *Mathematics at work 1*

In Task 2, "Feeding time", the central idea is to draw attention to further features of counting, specifically to the existence of 1-to-1 correspondences between sets. Again, a textual character is involved, but this time as a passive object of the gaze of the acquirer (see Plate 6.9). The idea of 1-to-1 correspondence is implicitly introduced by showing a picture of animals and their food; asking if there is enough food, including a reason for the answer; and then asking the acquirer to count the number of animals in the set and the number of units of food available.

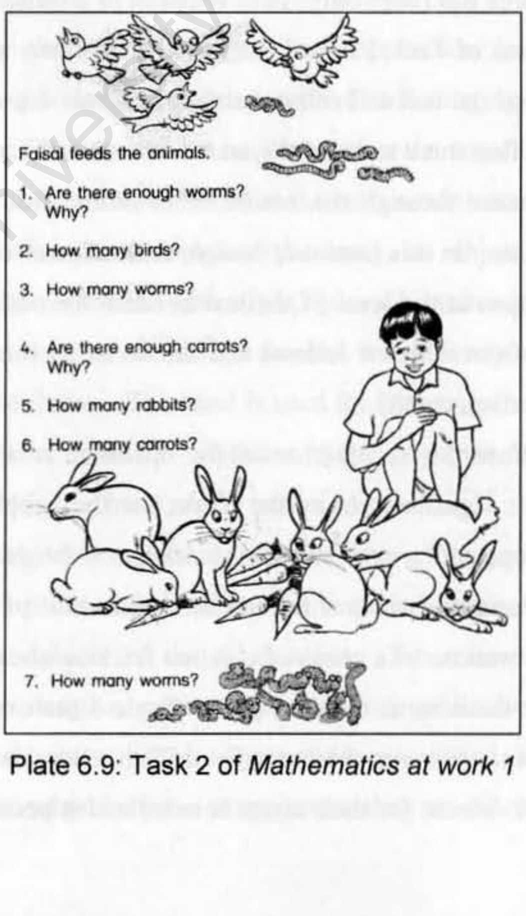


Plate 6.9: Task 2 of *Mathematics at work 1*

It is the lack of equinumerosity between two sets (4 birds, 5 worms; 6 rabbits, 5 carrots) that is meant to draw attention to the notion of a 1-to-1 correspondence. The acquirer is intended to move from the act of the enumeration of a set to the idea of a 1-to-1 correspondences between sets to the notion of counting.

The problems, implicitly depending on the acquirer "spontaneously" privileging a 1-to-1 correspondence between animals and a portion of food (each bird eats one worm; each rabbit eats one carrot), has the potential to deliver a judgement on the activity of Faisal, the textual character: has he supplied sufficient food for the birds and rabbits? As representative of the ideal-ego in Imaginary identification the textual character has to be negated in favour of that which represents the virtual point from which acquirers will appear likeable to themselves, Symbolic identification: the acquirer as ego-ideal. In other words, the textual characters (and their activity) function as hooks from the Imaginary into the Symbolic. At this point it retroactively becomes clear that the textual characters themselves do not necessarily understand counting to involve 1-to-1 correspondence between the elements of a set and the set of counting numbers. This characteristic of counting is, however, not really developed further at this time in any explicit manner. The acquirer is instead restricted to enumerating different sets.

The continuity across Tasks 1 and 2 is established by starting from a description of the body as a collection of sets, moving to sets of animals and sets of animal food items, to the recognition of the existence of sets of numbers.

Task 3, "Animals," is entirely concerned with the judgement of the (proto-)notion of counting: can the acquirer count now that s/he has (hopefully) been required to produce a more adequate predication of counting? All the problems of Task 3 are of the form "How many *x*?" and have to be solved by examining the appropriate pictorial text and enumerating the objects depicted.

Over the sequence of the first three tasks of the text we see that the acquirer has been subjected to the movement of the judgement through the notion of counting, from immediacy to reflection to apparent necessity to the notion. In this instance, though, the notion of counting cannot be considered as any more than a proto-notion at the level of the text because the notion is never represented other than implicitly at any stage, from which it follows that the necessity intended to be established is not true necessity but rather a quasi-necessity.

Here we should not confuse our recognition of the operation of the notion of counting in the structuring of Tasks with the significations of the Tasks for the neophyte. The authors appear to commit just such an error repeatedly, not only in the design of the *Mathematics at work* texts but, significantly, also in their research (which informed the production of the texts). In an interesting paper reporting on their observations of a group of children learning about fractions (rational numbers) they argued that by the time those same children got to Grade 3 their understanding of fractions had regressed because they could not solve problems in Grade 3 that they could in Grade 1 (Murray *et al.*, 1996). However, when the evidence for their claim is examined it becomes clear that in Grade 1 the children were using a proto-notion supported by iconic representation: in Grade 1 the children could draw pictures of the solutions to problems of "sharing" (division) to show the results of having cut up whole objects into a number of equal parts. In Grade 3 the same children were required to solve problems by performing mathematical operations on symbolic representations of rational numbers, but failed to do so appropriately. The authors then asked the children to redo the problems in the manner in which they were solved in Grade 1 and, of course, they produced solutions that could be read as correct. What this indicates is not that the children necessarily regressed, but rather that the acquisition of the notion of a rational number at Grade 1 level was merely apparently so and that the children never acquired the notion subsequently. What the children actually learnt in Grade 1 was a technique for generating a representation that could be aligned with a mathematical description, produced by the authors, in terms of operations on rational numbers. Having drawn a distinction between signifiers and signifieds, reasonably arguing that the acquisition of the former does not guarantee the presence of the latter as intended, they nevertheless proceed to privilege specific forms of representation as necessarily indicating the acquisition of the intended signifieds and end up committing precisely the error they warn us against. The problem is with the attachment of necessity to specific forms of representation viewed as stable indices of the acquisition of signifieds.

Returning to the texts, this situation in which proto-notions are used because they can be described as full notions by the authors is not unique to the first few Tasks of the *Mathematics at work* series but is a general feature of the texts across Grades 1 to 4, as can be seen by referring to the "Comparing houses" Unit of the Grade 4 text where the predication of the notion of two-dimensional measure remains largely implicit.

Note that Task 3 stages the knowledge-ignorance opposition in its *paradigmatic form*: the judgement of the notion is precisely concerned with distributing ignorance to the acquirer and knowledge to the transmitter. The acquirer has to demonstrate the negation of ignorance.

The other aspect to draw attention to here is that the auto-eroticism of the child is also of concern even if never openly referred to, and therefore the body, as object of auto-erotic activity, and specifically the hand, has to be contended with. It is, from a Freudian point of view, no surprise that the first task in the Grade 1 text of the series focuses immediately on objectifying the body by submitting it to numerical calculation. The hand is used for both counting and for auto-erotic activity. The acquirer is intended to move from the recitation of the sequence of whole numbers to the body (fragmented as sets), mediated by the hand, to the notion of counting.

The operation of the contingent is caught in the open form of the problems ("I have x ..." or "My hand has ...") and reveals the position from which the acquirer speaks; that is, it potentially provides insight into the level of the subject of the enunciation. For example, the possible selection of prohibited body parts (breasts, vagina, penis, anus, testicles), while formally perfectly valid, would indicate an instance of moral deviance: as the subject of the enunciated (statement) such body parts are valid, but as an index of the subject of the enunciation, they would indicate an irruption of illicit enjoyment. Pedagogy *qua* moral discourse is always interested in glimpsing the subject of the enunciation, because it is the latter that reveals moral deviance and illicit enjoyment.

To see that the subject of the enunciation is of concern more generally, beyond concerns with the body, we need only recall the previously cited unabashed moralising of the authors when they imagine the deviant subject of the enunciation dangerously flashing up before them: "A pupil's question like 'Is it a divide?' is a serious danger sign with respect to the pupil's attitude towards problem solving and learning — it usually indicates that the pupil is not intent on understanding the problem or trying to solve it independently." And: "Children may expect the teacher to tell them how to solve a problem or try to identify the operation or number sentence for a given problem instead of trying to make sense of the problem. Jolt them out of this unacceptable behaviour by confronting them with an unusual problem for which they cannot identify a number sentence or operation." What is it that eludes the grasp of pedagogy and disturbs the authors to the extent that they feel compelled to express themselves in a manner approaching vehemence? In calmer moments the authors would have us believe that their sole concern is with the intellectual well-being of the child whose acquisition of logico-mathematical thought should not be compromised or retarded by bad teaching (cf. Murray, Human & Olivier, 1997b: xx - xxi). While the authors ascribe disruptive intent to children exhibiting certain behaviour, their examples of such behaviour merely indicate that their imaginary charges wish to know what resources might be drawn on to reproduce the prescribed mathematics contents. Perhaps the discomfort the authors experience is generated by the possibility that mathematics can be reproduced without the acquirer being subjected to the forms of social regulation they (the authors) prescribe. This is not just a quirk of the authors, but rather a general feature of all pedagogies.

We can track the movement of the judgement for the sequence of tasks across Tasks 1 to 3, marking at the same time the modalities of the Imaginary, Symbolic and Real at play. *Immediacy/existence*: In Task 1 the textual characters as mirror image coupled with the signifier as (1) meaningful in the image, but (2) meaningless in terms of mathematics; meaningless because the rhyme 1, 2, 3 … is considered to be just that and not yet counting. Both (1) and (2) are instances of ignorance with respect to mathematics.

Reflection/possibility: In Task 2, the acquirer's attempt at producing mathematically meaningful language by confronting the meaninglessness of mathematics; that is, a confrontation with the Symbolic.

Quasi-Necessity/necessary: Again in Task 2, the acquirer's negation of both the mirror image (Faisal got things wrong) and the signifier as meaningful in the image (sets of animals not equinumerous with the sets of their food) in order to produce mathematically meaningful language (the answers the question "Why?" has to be framed in terms of 1-to-1 correspondences between sets).

Proto-Notion/Contingency: Task 1 to Task 3. The negation entailed in the production of quasi-necessity works at another level as well, by attacking that which might ruin the smooth operation of the pedagogy and thus disturb the reproduction of mathematics: the bodily enjoyment of the acquirer;

the Real of *jouissance*. (From Task 1, mathematising the body by counting its parts, to Tasks 2 and 3, counting the bodies of non-human, organic beings.)

Notice also the use of the basic matrix operative in induction, Particular-Singular-Universal. *Particular*: the situation of focus on (1) the body of the acquirer and (2) the feeding of the animals. *Singular*: the acquirer's free selection of the body part to be enumerated. *Universal*: the recognition of what counting is through (1) the selection/naming of a set, (2) enumerating the elements of the set, and (3) recognising the functioning of 1-to-1 correspondence. Again we must add that the universal appears to reside on the side of the transmitter rather than acquirer.

One of the most interesting features of the text is beginning to reveal itself, even at this early stage: the text starts with the narcissism of the ideal-ego, negates it, and moves the acquirer towards the construction of the ego-ideal. Further, we should not miss the point that the ego-ideal itself implies a strictly social instance: the point of view from which the acquirer's existence comes to be experienced as lacking can be escaped only by accepting the hypothesis of the existence of the external existence of an agent, or field, that guarantees meaning. This virtual existence is nothing other than the locus of the ego-ideal. The pedagogic problem brought into sharp focus by considering the relationship between the ideal-ego and the ego-ideal is that of the establishing of a field of authority for the reproduction of disciplinary knowledge while caught in an ideological constellation that apparently attempts to suspend the external imposition of boundaries (and so, universal meaning). In different terms, the problem is that of how pedagogic subjects can come to see "truth" and meaning as social (ego-ideal/Symbolic identification) in politically correct times in which they are led to narcissistically believe that only self-knowledge is valid (ideal-ego/Imaginary identification).

6.3.2 Tasks 23, 24 and 25 of *Mathematics at work 1*

Tasks 23, 24 and 25 of *Mathematics at work 1* is indicated by the authors as developing the notions of "equalising" and the equal sign.

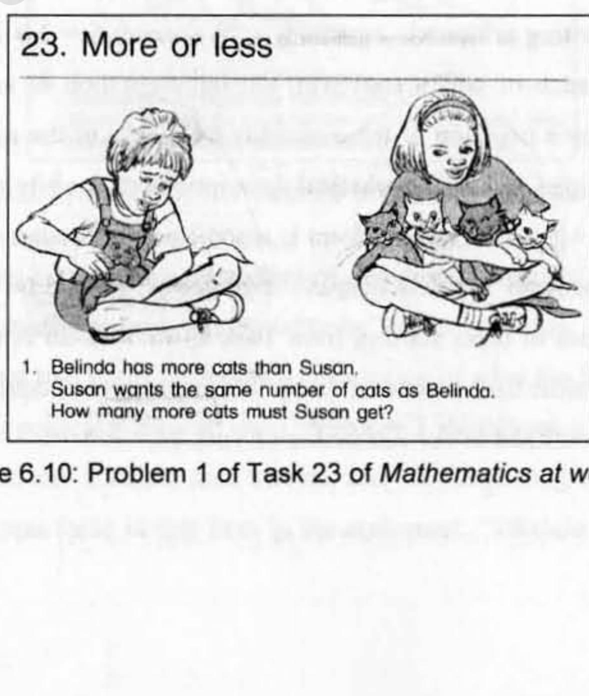


Plate 6.10: Problem 1 of Task 23 of *Mathematics at work 1*

In Task 23, "More or less," the focus is on numerical equality in an attempt to set in place the grounds for an adequate predication of the equal sign. The idea of "balancing" is intended to be a pedagogic resource (Murray, Human & Olivier, 1997b: 9). Note that here the context of the development of the notion of equality is made to rely on the idea of equality between people (textual characters) in terms of the possession of some or other good—in this task it is the possession of an equal number of cats (Plate 6.10). In other words, the development depends on the adoption of a moral position, one that has been prepared for in earlier tasks.

In Task 24, "The same," we find that the idea of a balance in the form of a see-saw is used to approach the idea of equality. An interesting feature of all the problems is that the total number of beings (boys, girls, cats) meant to be balanced on the see-saws, so that the "sides are made equal," represent an odd number in each instance: problem 1, 5 boys; problem 2, 7 boys in the first instance, 15 girls in the next, and 17 cats in the last. There are at least four strategies that can be used to get the see-saw to balance if we ignore the fact that actual beings will have different masses: (1) distribute an equal number of beings on either side of the fulcrum and have one positioned on the fulcrum; (2) distribute an equal number of beings on either side of the fulcrum and remove the one left over; (3) make the number of beings on either side of the fulcrum the same by removing the excess from the heavier side—there are clearly a number of variations possible in this instance, like, for example, choosing *any* possible even number of beings from the total number, distributing them equally, and then getting rid of the rest.; and (4) add more beings to the "lighter" side of the see-saw. None of these strategies fit particularly well with the idea of operations on an equation. What we have here are situations in which we are moving from an inequality to an equation. The metaphor, "an equation is a balance," which is operative as a ground in Task 24, is meaningful only when the balance is in a state of equilibrium, otherwise we have a metaphorical representation of an inequality. When working with equations what is of importance is that we do not violate the "balance" (the identity) that, by definition, already exists.

Task 25, "Making equal", continues with a focus on equality and introduces the mathematical notation and syntax for writing arithmetic equations: "We write: $5 = 3 + 2$." The task kicks off by presenting two examples each of which start with the representation of an inequality (as a state of disequilibrium) followed by a negation of the inequality by means of the addition of objects so that a state of equilibrium is attained. The mathematical descriptions of equilibrium, in this instance, are of the forms $a = b + c$ and $a + b = c$. The first form is associated with statements of the type "a is more than c"; the second with the form "a is less than c".

If we now read the series of tasks starting from Task 23 to Task 25 retroactively, we see that the privileged strategy for the shift from a state of disequilibrium to one of equilibrium is that of *addition*, that is, the fourth strategy outlined in our discussion of Task 24.

6.3.2.1 From *desire* to *ought* to *is*

The series of Tasks from 23 to 25 show an interesting trajectory at the level of regulative discourse that mimics, or redoubles, the level of instructional discourse. We have shown that, at the level of instructional discourse, the movement of the understanding has a trajectory starting with immediacy, moving to possibility, and on to necessity. At the level of regulative discourse we see a trajectory starting with *desire*, moving to *ought*, and on to *is* as follows:

Desire

Problems 1 and 2 of Task 23 describe a situation of difference between two textual characters. For example, consider problem 1: "Belinda has more cats than Susan." / "Susan wants the same number of cats as Belinda." / "How many more cats must Susan get?" Here the subjective state of the textual character Susan is one of wanting. While Susan's *wanting* is made to reference cats, it is also a *wanting-to-be the same* as the other textual character, Belinda. In other words, what we have here is the classic (Lacanian) situation of the registration of desire: "desire is the desire of the other." In addition we should note that this wanting-to-be immediately produces a conjuration of the spectral presence of an *ought*, which appears in the question in the form of "must": "How many more cats must Susan get?"

Ought

Problem 3 of Task 23 differs from problems 1 and 2 by introducing a suggestion of wrongdoing as an explanation for differences between the textual characters (Plate 6.11).

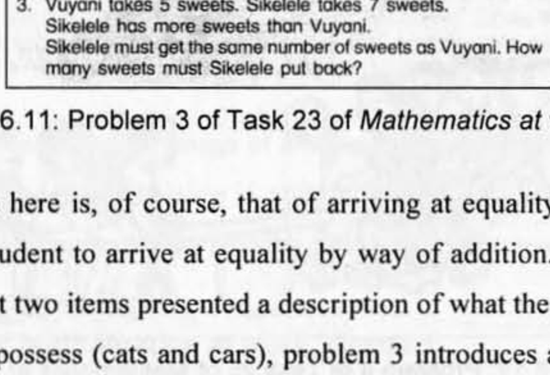


Plate 6.11: Problem 3 of Task 23 of *Mathematics at work 1*

The mathematical focus here is, of course, that of arriving at equality by way of subtraction; the first two items asked the student to arrive at equality by way of addition. However, what we cannot escape is that where the first two items presented a description of what the textual characters possessed and not how they came to possess (cats and cars), problem 3 introduces a performative dimension as regards possession: Vuyani and Sikelele *took* sweets, and the latter took more than the former. The *ought* arrives at its full moral force in this item in the statement: "Sikelele must get the same number of sweets as Vuyani." This "must" is of a different order from that which we encounter in: "How many more cats must Susan get?" and: How many sweets must Sikelele put back?" The difference is that it takes the place of the wanting-to-be of problems 1 and 2 and what we have in the movement from problems 1 and 2 to 3 is the substitution of a subjective state of wanting with an "objective" governing of what *ought* to be—what ought to be the case does not emerge from any of the textual characters but rather from some external, panoptic presence. In other words, we have a movement from desire to the Law, and we see that the spectral nature of the ought that haunted desire has metonymically become aligned with the Law. This spectre is none other than the position of the ego-ideal, the thoroughly virtual point of symbolic identification from which the pedagogic subject can gaze at her/himself as likeable, but also, more negatively stated, from which the subject sees his/her actual life as lacking (Žižek, 2002).

Is

In Task 24 we see that it is the textual characters themselves who become units of value: each character is worth *one*; each child (and each cat) is a One, reduced to pure number. The moralising element of the previous task is backgrounded and we are confronted with a representation of what merely *is* in pictorial and written forms: "The two sides are not equal." / "1. How can you make them equal?" As discussed above, the privileged strategy for equalising becomes that of adding Ones to the "lighter" side of a see-saw. In Task 25 the main focus is that of learning to write down statements of equality (arithmetic equations in the form of so-called "number sentences").

An interesting illustration appears in problem 4 of Task 25 (Plate 6.12): the number sentence to be completed by the acquirer is "... = ..." and the illustration shows 5 boys on either side of the fulcrum of a see-saw. The boys on the left-hand side of the fulcrum are closer to the fulcrum than those on the right-hand side, and are being lifted off the ground. Whereas previously a strong connection between the state of equilibrium and having equal numbers of characters on each side of the fulcrum was established, problem 4 introduces a worm of doubt which threatens to weaken that connection.

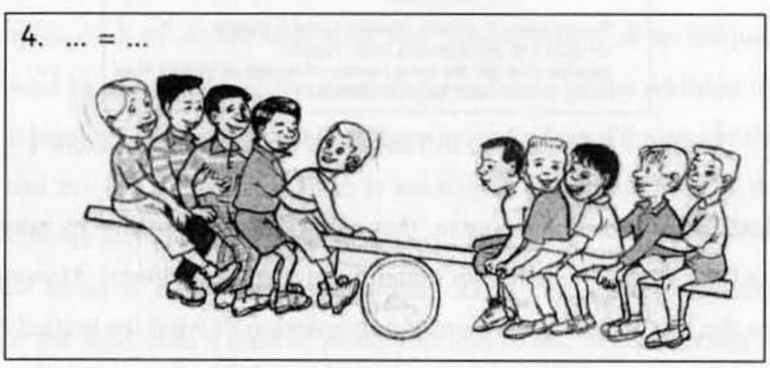


Plate 6.12: Problem 4 of Task 25 of *Mathematics at work 1*

It would appear that the metaphor of a physical beam balance is beginning to be negated here: what is important is that the values on either side of the fulcrum are the same, not whether the see-saw is in a state of equilibrium. The fulcrum in problem 4 now more fully comes to function as does the "equal sign" in an equation in that the "sameness" we are after with an equation is that of value and not physical identity between the objects displayed on either side of the "equal sign".

Plate 6.13: Problem 4 of Task 47, *Mathematics at work 1*

Problems 3 and 4 of Task 47 are interesting because they, like the problems in Task 25, apparently refer to the metaphor of an equation as a balance, but actually negate the metaphor. The numbers shown in the "number sentences" correspond to the numbers of actual objects disturbing the equilibrium of the "balance" (see Plate 6.13). Problem 4, unlike the familiar iconic rendering of the "balance," shows a textual character apparently representing both lever and fulcrum. Notwithstanding the appearance of the equation "4 = 10 - ...," a state of equilibrium, if that is taken to mean that the baskets are positioned at the same level vertically, *can* be achieved by imagining the character adjusting the force needed to hold up the baskets so that they are held at the same level—there is no need to have an equal number of objects on either side of the fulcrum. The only way in which "equalising" can now be understood is in the sense that it has nothing whatsoever to do with the activity of the pedagogic subject in terms of what they might do, outside of mathematics, to achieve the required effect. Rather, what we have is an implicit statement of the existence of an implacable Symbolic order when confronted by the vicissitudes of the contingent extra-mathematical activity of the acquirer.

It follows that the extra-mathematical image of a balance has nothing to do with an equation at the level of the Symbolic. The image of a balance is, strictly speaking, an Imaginary resource specifically recruited to effect move to the Symbolic, but through a negation of the sensibility of the image.

6.3.3 Tasks 80 and 40 of *Mathematics at work, Grade 1*

Task 80, "Fair and unfair," focuses quite explicitly on the moral by asking questions of fairness (Plate 6.14). The authors comment on the task as follows:

Task 80 poses two related problems, but introduces the possibility of other factors which may influence the decision. For both problems 1 and 2, it can be argued that the sweets should be shared exactly between the two children. If that has to be done, the solutions suggested by the [textual characters] (Belinda and Faisal) are not correct.

However, some children may suggest that the [textual; characters] involved may not have done an equal amount of work.

Both tasks 79 and 80 should be used as topics for discussion. (Murray, Human & Olivier, 1997b: 33-4)

The task is interesting because it potentially disrupts the previously established close relation between a moral position on equality and mathematical equality. In other words, having exploited a naïve sense of "fair play" initially when dealing with division, fractions and proportion, and having transferred the idea of equality as numerical equality to the study of arithmetic equations ("number sentences"), the authors now attempt to separate the moral from the mathematical.

1. Conrad and Belinda help their mother.
   Mother says: You can share these 30 sweets.
   Belinda says: I want 16 sweets.
   Is this fair?
   Why do you say so?

2. Sita helps Faisal to feed the animals.
   Faisal says: Let us share these 25 sweets. I shall take 14 sweets.
   Is this fair?
   Why do you say so?

Plate 6.14: Problems 1 and 2 of Task 80, *Mathematics at work 1*

It is as though the authors are concerned that the stain of contingency pollutes the establishing of (apparent) mathematical necessity and wish to show how the moral is different from and independent of the mathematical. Another way of saying this is that the authors appear to want to establish that the ideological elements which inevitably permeate pedagogy are not to be confused with the scientific rationality of logico-mathematical thought.

Finally, Task 40, "Getting to school," is the first task that deals with so-called "data representation," really sorting and tallying. Save for the addition of a new name, "data representation," there is nothing new here. However, here we have an exemplary case of the manner in which the addition of a name, while changing nothing and adding nothing of any substance, nevertheless produces something entirely new. The entire teaching methodology is presented here in capsule form: starting from a moment of imaginary identification of the acquirer with the textual characters, the acquirers are asked to describe themselves in a manner consistent with the identification, then they are asked to produce mathematised descriptions of their initial descriptions.

Plate 6.15: Introduction to Task 40 of *Mathematics at work 1*

The rest of the problems dealing with "data representation" are: "2. How do most children get to school?" / "Why?" / "3. Which way is used by fewest children?" / "Why?" / " 4. Which is the fastest way?" / "Which is the slowest way?" / "5. Which is the cheapest way of getting to school?" / "Why?"

Now what we should not fail to note is that while the description of the activity of the acquirer is such that pragmatic, utilitarian concerns take precedence over every other aspect of that activity, the responses to the question "Why?" have to be mathematical. This second level of description is meant to transform and displace the identification from the Imaginary to the Symbolic; that is, the acquirer-textual character identification ("Marga walks to school. How do you get to school?") is to be transformed into an acquirer-mathematics identification (numerical description of trends). The latter form of identification is one intimately bound up with the ego-ideal.

More generally, note that the relation between the title of a task and the mathematical topic is correlative to the relation between the Imaginary and the Symbolic.

6.3.4 From desire to the Law

From our discussion we now start to recognise the emergence of the trajectory of the regulative discourse in relation to that of the instructional discourse. Central to the instructional discourse is arrival of the mathematical notion at its truth. In terms of the moments of judgement, the trajectory is as follows (see Chapter 4):

$$[\text{existence} \rightarrow \text{reflection} \rightarrow \text{necessity}] \rightarrow [\text{notion}].$$

What the judgements are concerned with are:

[impossibility → possibility → necessity] → [contingency].

Now the element of contingency, associated with the judgement of the notion, derives precisely from the activity of the pedagogic subject, represented in this instance by the textual characters. But what is the nature of this contingency as pertains to the textual characters? Our contention is that the contingency is captured in the wanting-to-be, the desire, of the characters. However, we have seen that the staging of a wanting-to-be is tied into a trajectory through an ought-to-be and culminating in an is. In other words, the moment of contingency is bound up with the trajectory:

[Wanting-to-be → Ought-to-be → Is],

which serves as a predication of the judgement of the notion, so that:

[contingency] ⇔ [Wanting-to-be → Ought-to-be → Is].

Putting all of this together, we get:

[impossibility → possibility → necessity] → [[contingency]⇔[Wanting-to-be → Ought-to-be → Is]].

In other words, the judgement of the notion introduces the deontological into the reproduction of content. Now note that the modalities of judgement can be arranged to form a Greimassian semiotic square (Figure 6.2), demonstrating the internal consistency of Hegel's account.

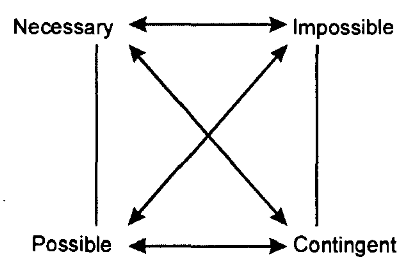


Figure 6.2: The moments of the judgement

A brief account of the Greimassian procedure and its productivity for the work developed here is given in an Appendix for two reasons. The first reason is that, despite its productivity, it does interfere with the flow of the argument and so becomes a digression; the second is that the prescribed textual space for this project does not permit us to insert everything that we judge productive (and interesting) in the elaboration of the argument. The reader who is unfamiliar with the work of Greimas can refer to the Appendix if they find it necessary to do so.

The modalities of judgement are nothing other than the conditions of possibility of the truth of the notion. It is, however, the case that the notion arrives at its truth only by way of a confrontation with the contingent, as was demonstrated above. This aspect of the judgement can be rendered more clearly if we perform a series of substitutions that transform the "ontological" semiotic square of the moments of the judgement into a "deontological" square (Figure 6.3), one concerned with what ought to be in which the necessary becomes that which is prescribed, the impossible that which is prohibited, the possible that which is permitted and, finally, the contingent is substituted with an X. Why an X? Because we have no adequate term to capture that which is not prescribed, incidental, yet not simply permitted (cf. Žižek, 2002: 133-7; 195-7). The X represents the potential for the irruption of a radical otherness circulating in the discursive gap, the possibility of an alternative to that which is prescribed.

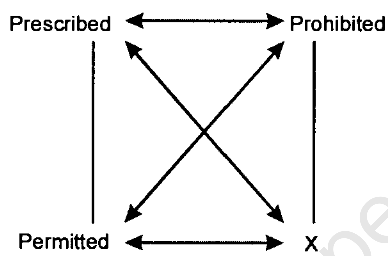


Figure 6.3: The moments of the judgement "deontologised"

What the relationship between Figure 6.2 and Figure 6.3 shows is that regulative discourse inevitably attaches to instructional discourse in the attempt to arrive at the truth of the notion because of the presence of the contingent. Figure 6.3 shows how the judgement deals with the contingent of Figure 6.2 by attempting to situate its content within a stabilising framework, but a point of indeterminacy nevertheless remains. In that way, the notion is discovered as already contained within the contingent, but with the addition of an excess which escapes its grasp (see Figure 6.4).

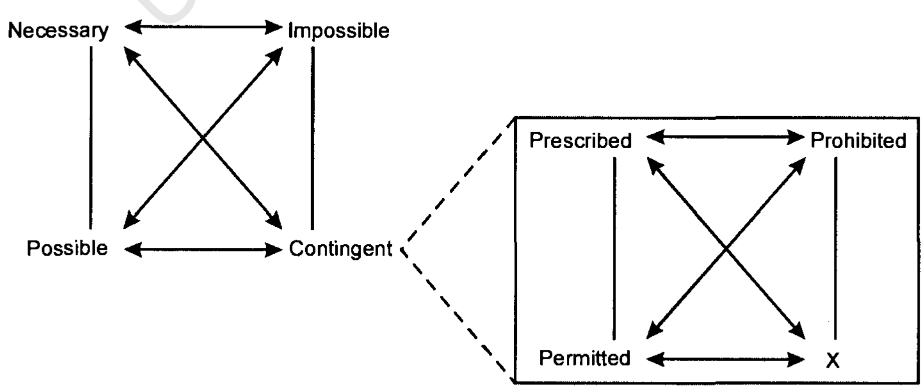


Figure 6.4: The relation between Figures 6.2 and 6.3

6.3.5 Impossibility, prohibition and pedagogic discourse

In this sub-section we are unfortunately obliged to move once more onto the terrain of Freudian and Lacanian psychoanalysis for the resources needed to establish a few more points.

If we now direct our attention away from the acquirer and towards the transmitter, an additional feature of the pedagogy is revealed. In the teacher's guides to the *Mathematics at work* texts the teacher is insistently warned against attempting explicit teaching because, according to the authors, it is impossible to transmit logico-mathematical knowledge; all such knowledge acquired by the student has to be constructed by the students themselves. For example:

> An important **difference** between social knowledge and logico-mathematical knowledge is the way in which the child learns them. Social knowledge has no particular logic attached to it and simply has to be accepted. For example, why is 17 called seventeen, but 71 is called seventy-one — the seven is **said** first in both cases, but not **written** first!
>
> In contrast, logico-mathematical knowledge has to be **constructed** by each individual. The child must therefore try to **make sense** of and to **understand** the mathematics involved. Therefore if a piece of logico-mathematical knowledge is presented in such a way that children **think** it is social knowledge, they will not even try to understand it, but simply accept it and try to memorise it. (Murray, Human & Olivier, 1997b: xxi; emphases in the original.)

> The best way to make young children realise that they are expected to make sense of mathematics is to pose carefully selected problems that make sense to them. Do not show them how to solve these problems. (Op.cit.: xiv)

> Some people feel that the teacher should sometimes show methods to weaker or slower children. Our response to this is an emphatic No. (ibid.)

Yet, it would seem that children are able to teach each other:

> When children compare their methods, they become aware of other methods and of ways to improve and shorten their current methods. (ibid.)

What we have then is a prohibition on the transmission of (logico-mathematical) knowledge by the teacher because its transmission is judged to be impossible. The substitution *impossibility* ↔ *prohibition* is precisely the central substitution at work in the prohibition of incest in Freudian and Lacanian theory. Incest is prohibited for the reason that it is "impossible" in the Freudian/Lacanian sense that it necessarily fails to realise the initial unity of the subject and the other. In its necessary failure, it destroys the fantasy of a perfect unity—the latter being nothing less than the condition of possibility for (the myth of) society. The prohibition of incest is transmuted into the so-called "paternal metaphor," in which the desire of the mother is to be substituted by the name-of-the-father. In other words, the process of socialisation—or, *symbolic castration*, as Lacan would have it—entails renouncing the enjoyment of the (primordial) incestuous object in favour of integration into the Symbolic order; that is, in favour of that which is permitted. The term *name-of-the-father* derives from Freud's discussion of the father in relation to the constitution of society in *Totem and Taboo*, where the primordial father who commanded all enjoyment, having been murdered by the primal horde, returns much stronger in symbolic form in the guise of his name. The distinction thus produced is between the "real" father and the symbolic father. The former is a filthy *jouisseur* who appropriates all enjoyment and thereby excludes the rest of us from enjoyment, while the latter is the bearer of symbolic authority who allows all of us some measure of pleasure by regulating symbolic exchange. If the story were to end there it would be little more than a utilitarian position on morality: we give up something—enjoyment of the incestuous object—in exchange for long-term pleasure and happiness. Lacan's point is, however, that the "real father" who prohibits all enjoyment, especially our enjoyment of the incestuous object, is a retroactive construction resulting from the experience of the symbolic order as itself inconsistent, hence lacking. To the extent that our enjoyment of the incestuous object is impossible, by giving it up we actually renounce nothing in exchange for something (cf. . Žižek, 2002: 230-1). It is interesting to note that in his discussion of the moral law and the name of the father, where Lacan draws on Freud's *Totem and Taboo*, he makes a link between animality and the primal father:

> If the Other is as I say, the place where "it"—ça—speaks. it can pose only one kind of problem, that of the subject prior to the question. And Freud intuited this admirably ... Mythically, the father—and that is what *mythically* means—can only be an animal.
>
> The primordial father is the father from before the incest taboo, before the appearance of the law, of the structures of marriage and kinship, in a word, of culture. The father is the head of that horde whose satisfaction, in accordance with the animal myth, knows no bounds. That Freud should call him a *totem* takes on its full meaning in the light of progress brought to the question by the structuralist critique of Lévi-Strauss, which, as you know, brings into relief the classificatory essence of the totem. (Lacan, 1990: 88)

If we now return to our discussion of the pedagogy promoted by the authors of *Mathematics at work* there are a number of points to be made in terms of the Freudian-Lacanian account of the relation between *jouissance*, pleasure and the constitution of society. First we have the retroactive construction of a caricature of the pedagogue who teaches by means of exposition, producing an image of a ruthless, authoritarian, hence anti-democratic, figure who instils fear rather than respect; in Lacanian terms, a filthy *jouisseur.* This is the teacher who teaches by "chalk-and-talk" and forces students to learn by rote, in that way turning logico-mathematical knowledge into "social knowledge" which has "no particular logic attached to it" (Murray, Human & Olivier, 1997b: xxi). This is the one who gives good students an approving "pat on the head" (Von Glasersfeld, 1991: xviii; quoted in Human, Olivier, Murray & Du Toit, 1993b: iii - iv) and who lambastes and humiliates the weak. In fact, Von Glasersfeld, whom the authors draw on extensively, paints a picture of the so-called "traditional teacher" as a drill-sergeant: "The motivation to please superiors without understanding why they demand what they demand, may be required in an army — in an institution that purports to serve the propagation of knowledge, it is out of place." (ibid.).

Next, the difference between so-called "traditional teaching" and the pedagogy championed by the authors is also described as a difference between teacher- and learner-centred teaching; "traditional teaching" being the teacher-centred modality. For example, in the Introduction to the teacher's guides, the *Mathematics at work* series is described as "facilitating a learner-centred approach to teaching" (Murray, Human & Olivier, 1997b: first page of text, no page number). If we set to one side the crude caricature of expository teaching often employed by the proponents of learner-centred pedagogies, then the curious thing about the supposed opposition between learner- and teacher-centred teaching is that neither of the antagonistic poles of that opposition can convincingly be aligned with "traditional teaching" for the simple reason that the "centre" of the latter entailed the explicit subjection of both teacher and student to disciplinary knowledge (mathematics, in this instance). In other words, the opposition between learner- and teacher-centred teaching resides entirely within learner-centred pedagogies. The retroactive construction of the "traditional teacher" who comes to be aligned with teacher-centred teaching is nothing less than the rationalisation of an ineradicable cleavage within education itself, a cleavage between the operation of the pleasure principle and the excess of enjoyment that is beyond the pleasure principle. It is this excess which is displaced onto the scapegoated "traditional teacher," who comes to function as the disavowed kernel of leaner-centred teaching, as impossible and hence prohibited. If we examine the pedagogy to assess whether or not, with respect to knowledge, the "centre" has shifted from mathematics to the "learner," we find that both teachers and students still remain subjected to mathematics, and that the learner-/teacher-centred opposition is one concerned with a change in the *regulative discourse* which, taking its cue from the distributive rule of the pedagogic device, offers pleasure in return for renouncing *jouissance*. It is not accidental that we once again discover the image of the model student in the guise of the model teacher as we did when discussing the dedication in the Grades 1 to 3 texts: the "learner" of learner-centred teaching as the one opting for pleasure rather than *jouissance*; the learner-centred teacher who regulates symbolic exchange ("facilitates") allows us pleasure while renouncing the evils of the "traditional teacher" (the teacher-centred *jouisseur*).

6.4 Summary

At this point we should return to the discussion of the modalities of the signification of pleasure in the *Mathematics at work* series. The mice, one of whose significations is that of the teacher, moves from being associated with a disruptive modality of pleasure which we referred to as *pixilation* (in the Grades 1 to 3 texts) to a modality associated with Symbolic identification, which we referred to as *ideal fun* (in the Grade 4 text). The other modality of pleasure was referred to as *fun*. Table 6.3 shows that many of the Tasks (Grades 1 to 3) that signify fun also signify pixilation: 18% in Grade 1, 18.8% in Grade 2 and 15% in Grade 3. Pixilation is absent from the Units of the Grade 4 text. The distinction between fun and pixilation represents a split internal to the signification of pleasure in the texts in which the former (fun) is benign while the latter incorporates disruptive elements. The disruptive elements of pixilation are signified by the type of images shown in Plate 5.5 of Chapter 5, where we see an anthropomorphised mouse hurling a fruit at a cat and hitting it in the back of the head. On the other hand, as was also pointed out in Chapter 5, an anthropomorphised mouse often confronts the reader with sensible questions and comments. The figure of the anthropomorphised mouse therefore produces significations of serious attention to teaching and mathematics as well as significations of moments of blind enjoyment unrelated to either mathematics or the extra-mathematical activities depicted. Given that the presence of the mouse, in general terms, attaches significations of pleasure to the Tasks, pixilation metaphorically stages the two faces of the teacher with respect to pleasure: one profane (blind enjoyment), the other sacred (seriously attending to the reproduction of mathematics). By Grade 4 the profane face of the teacher is excised from the series to leave only the sacred—an examination of the Grade 4 text reveals that only benign forms of pleasure remain associated with the figure of the mouse. To the extent that the anthropomorphised mouse is also an image of the model acquirer, the disruptive significations which are initially attached to it (Grades 1 to 3 texts), but then later excised (Grade 4 texts), must simultaneously be metaphorical representations of the disruptive impulses of the student, so that the representations of those impulses disappear by the time the student encounters the Grade 4 text.

The figure of the anthropomorphised mouse in its disruptive guise is an interesting textual device in that it transforms blind enjoyment into transgression in the following way. First, in its impossibility (as a mouse acting as a human) it is a figure for the functioning of enjoyment outside of the Symbolic. Secondly, by functioning as a dual metaphorical substitution for both the teacher and student, it is grasped by the Symbolic as transgressive rather than merely as that which prevents the Symbolic from closing up on itself. The distinction between the two is crucial: that which prevents the Symbolic from achieving closure, but which takes no account of the Symbolic, is aligned with the drive and *jouissance*; that which is transgressive is already caught up in the Symbolic and so acknowledges the Law, which is another way of saying that it is aligned with desire. Pixilation therefore contains within itself an already-domesticated rendering of an enjoyment that is beyond the pleasure principle and ultimately acts in such a way as to prolong the functioning of the pleasure principle. In Bernstein's terms, we might say that the textual strategy of pixilation is one which coaxes pedagogic subjects into disavowing the structural necessity of the discursive gap.

Let us recall Freud's definition of education: an incitement to the conquest of the pleasure principle, and to its replacement by the reality principle. Freud soon discovered that the reality principle was not opposed to the pleasure principle but operated in the latter's favour by, ultimately, prolonging its operation, leading him to the discovery of an enjoyment beyond the pleasure principle. Should we then, on the basis of Freud's discovery of enjoyment beyond the pleasure principle dismiss his definition of education as flawed? No, because in its avoidance of what Lacan would term encounters with the Real, Freud's definition of education remains accurate. The "reality" of Freud's reality principle does, of course, always need to be historicized in concrete analysis. In our context that "reality" is an education system structured by utilitarian moral regulation, resulting in a pedagogic modality that displays many, if not most, of the features of competence pedagogies.

Chapter 7

The *problem-centred approach* to pedagogy and the injunction to enjoy

7.1 Introduction

In this Chapter we discuss empirical instances of teaching and learning that the authors of the *Mathematics at work* series consider to be exemplary of the problem-centred pedagogy promoted by the originators. The originators were asked to make available for analysis video records of teaching and learning, preferably across a range of socio-economic contexts, that they believed demonstrated the central features of the pedagogy. To that end the originators supplied video records of teaching and learning in five different classrooms across three schools: (1) two classes in an English-medium private school for girls (Grades 2 and 3) and interviews with five Grade 3 students; (2) two classes in an English-medium, predominantly "coloured" public school situated on the Cape Flats (Grades 2 and 3); (3) one class in an Afrikaans-medium, predominantly white public school (Grade 2), interviews with eight students and an interview with the teacher. Recall that the video records made available are part of an archive of raw footage used in the production of episodes of an educational television series, *Awethu*, which was broadcast nationally by the South African Broadcasting Corporation. The video footage was gathered in order to construct a series of pedagogic texts promoting a problem-centred approach to teaching in such a way that *different elements of the approach* are emphasised in each instalment of the series. This means that the video records are not of the type we might usually collect when conducting educational research: that is, they do not present a sustained focus on the same classes of phenomena across different schools and classrooms for the purposes of comparison and in order to distil from that the general features of the pedagogy. Here the universal, in the terms of the pedagogic principles of the "approach," is already at work in the structuring and production of the video records from which footage was selected and edited into a series of proselytising texts on how the pedagogy ought to be realised. What the originators of the "approach" have selected and provided for analysis is, in a sense, extracts from a single, larger pedagogic text aimed at educating school teachers and the general public about what the originators consider to be significant features of the "approach."

Two video records of teaching and learning are worth analysing in detail, one being that of the Grade 2 Afrikaans-medium school and the other showing one of the authors teaching a Grade 3 class in the Cape Flats school. The video records of the other classes were fairly brief and appeared to be done merely for purposes of capturing surface features of the pedagogy in a suitably wide range of contexts for promotional purposes. We will first discuss the latter cases briefly and then produce more detailed analyses of the two principal cases we have selected.

7.2 English-medium private school for girls, Grades 2 and 3

The video records of teaching and learning in the private school for girls proved to be one of the least interesting for analysis of the promoted pedagogy. Save for the private school teachers using word problems and apparently encouraging the students to use different strategies for solving problems, the performance of the teachers could not be aligned with the pedagogy promoted by the authors. For example, the teachers constantly delivered judgements on the work of students while they attempted to solve problems, indicating clearly when they believed a student to be correct or when they made mistakes. The teachers would say things like, "Well done, my poppet!" (sic) when they were pleased, or "Be careful!" when they thought they spotted an error.

The teachers also did not wait until students had solved problems to comment on their solutions. Instead the teachers made certain that the students were producing solutions in line with what they had envisaged. In one such instance, in the Grade 3 class, a student who was calculating the product of 96 and 42 produced an intermediate calculation in which she calculated the product of 9 and 40. The student was still in the process of calculating the original product and had not completed the problem, but the teacher, judging the appearance of 9×40 to be an indication of an error, interrupted the student with: "It's 90 times 40, not 9 times 40." In terms of the general strategy apparently encouraged by the teacher—the decomposition of numbers along with the application of the commutative, associative and distributive laws—there was no way in which she could know whether or not 9×40 indicated an error until after the student produced a final answer to the original problem.

A different student produced an intermediate calculation in which she used the product of 90 and 4, and the teacher responded in a similar fashion, even though the student had not completed the problem yet. The point is that in terms of the pedagogy *any* decomposition that did not violate the structure of the natural numbers and the laws of mathematics, and did not alter the numerical value of the original problem, would be considered legitimate. For example, a student might write down $9 \times 40 = 360$ and then do the calculation $360 \times 10 = 3600$ on their way to the final solution. Similarly, $90 \times 4 = 360$ and $360 \times 10 = 3600$. The "it" to which the teacher appealed to inform her judgement could only be the a very particular solution as envisaged by herself, in which it would seem that calculations using decompositions other than $96 = 90 + 6$ and $42 = 40 + 2$ were not considered, that despite the principles of the pedagogy being promoted.

When we focused on the use of groups in the private school classes, we found that it did not conform to the prescriptions of the promoted pedagogy. Even though the students were arranged in groups around hexagonal arrangements of tables, they all worked independently and silently, never discussing their solutions with other students. A few students even covered their calculations with a free hand so that their peers could not spy on their work. The students would show their solutions only to the teacher for confirmation of correctness. Once all the students completed their solutions, the teachers would select one or two students to go to the front of the classroom and describe their solutions to the rest of the class.

In the Grade 3 class the teacher started the lesson with a problem referencing a Rolling Stones rock concert. She held up a shirt which had a picture of the Rolling Stones printed on it and asked the students who it was that was shown in the picture. All the students appeared to know that it was Mick Jagger and the Rolling Stones. She then proceeded by announcing: "Today our first problem is going to be all about the Rolling Stones concert." She then placed a problem statement on the overhead projector which read: "Mr and Mrs. Jones and their four children came from Durban to see the concert. Each ticket cost R195. How much did Mr Jones pay for his family?" After having the students read through the problem aloud, she instructed them to start working. All the students whose working was shown on the video record immediately wrote down "6 × 195" and proceeded to solve the problem. It is difficult to see how the extra-mathematical context of the problem contributed to the students' understanding of the mathematics involved. The extra-mathematical context could, of course, function as a test enabling the teacher see whether or not the students were able to recognise an instance of multiplication. The next problem was one in which the students were required to calculate the number of people transported by 96 buses each carrying 42 people. The students immediately wrote down "96 × 42" and proceeded to do the calculation and solve the problem.

In the Grade 2 classroom the teacher placed a problem, written on a sheet of cardboard, up on an easel. The problem read: "Mum was picking flowers. She picked 27 flowers and put them in 6 vases. How many flowers did she put in each vase?" All of the students appeared to write down "27" and "6" immediately and proceeded to draw images of six vases after which they made marks either inside or above the vases to represent the flowers as they counted off the 27 flowers, distributing them to one of the six vases by moving from one vase to another in sequence and then starting from the first vase again once they had associated a flower with the sixth, until all the flowers were exhausted. None of the students appeared to experience any difficulty in arriving at the required solution: 4 flowers in each vase with 3 left over. The ease with which the students proceeded through the solution procedure and the uniformity of the solutions across students suggests that they were using a well-rehearsed procedure for doing division. Not one of the students suggested that "mum" might have placed 5 flowers in 3 of the vases and 4 in each of the rest; nor did they suggest any solution other than the one described here.

What the above description of teaching and learning suggests is that in the private school the modality of the pedagogy was one of strong classification and strong framing despite the references to the extra-mathematical in the narratives of the word problems used. The transformation of a task apparently exhibiting weak classification and framing into one of strong classification and framing is not unusual in the context of middle-class schooling (see Holland, 1981 and Bernstein, 1990: 95 - 130). Mathematics was clothed in extra-mathematical terms which were rapidly dispensed with in Grade 3, and which were used as representational resources, somewhat like a form of notation, in

Grade 2. Even though the Grade 2 students used representations of flowers and vases in their solution of the problem, they used those representations as part of a well-rehearsed algorithm which was insensitive to the "reality" of the extra-mathematical context. Before the introduction of the pedagogy under discussion here the Grade 2 students would probably not have been presented with a problem corresponding to "calculate 27 ÷ 6" because of the remainder produced. In Grade 3 they would have been required to use the division algorithm to produce the solution "4 remainder 3" in answer to the problem "calculate 27 ÷ 6." However, had the classification and framing actually being weakened with respect to the mathematical content we would expect the students to produce a range of reasonable solutions to the problem and we would also not expect them to produce a solution that included left over flowers because the extra-mathematical context enjoys a greater degree of pragmatic flexibility than the mathematical context.

So what we have in the private school is a weakening in the classification of the representational resources used (expression), but not of the mathematics content—an instance of Dowling's *expressive domain of practice* (Dowling, 1998). Where the extra-mathematical representational resources are used to perform calculations they are used in a manner which conforms to the form of mathematical representations; that is, the extra-mathematical representational resources are transformed into a form of mathematics notation.

7.3 English-medium public school on the Cape Flats, Grade 2

The teacher started the lesson with the statement: "It is the thirteenth today, so we are going to work with the number 13." All of the students were sitting on a mat in front of the chalkboard on which was stuck a large matrix containing the numbers from 1 to 100 arranged in ten rows of ten numbers. Such a matrix of numbers is often referred to as a "100 square" in primary school parlance. Below the 100 square, resting on a chair, was a box of yellow cube-like plastic blocks that could be joined by fitting the top of one into the base of another so that strips of the blocks could be formed. The teacher asked a student to go to the chalkboard and collect and join thirteen of the blocks. As the student did so the rest of the class was asked to count aloud from 1 to 13 as the blocks were selected and joined together. A different student was then asked to use a pointer and count from 1 to 13 while pointing at the appropriate number on the 100 square. Again the rest of the class was required to count along with the student.

The teacher then asked a student to tell her how many tens there were in thirteen, to which he replied that there was one ten. She then asked him to show her on the 100 square how many tens there were in thirteen and he pointed, hesitatingly, to the number 10. The teacher then asked the student who had joined the blocks to separate 10 from the strip to show that 13 consisted of one 10 and three 1s. The point of the lesson (really a lesson fragment) was to introduce the students to the idea of the decomposition of numbers.

Throughout the performance, the camera operator was positioned awkwardly, off to one side because the whole class was on the floor in front of the chalkboard and he therefore was not capturing adequate images of the action. He regularly asked the teacher and students to repeat themselves after he had repositioned the camera. The teacher would then ask her questions again and the students were required to respond again, just as before. However, the students starting becoming very confused and unsure of themselves because the teacher was asking them the same questions repeatedly. It seemed that the students concluded from the repetition of the questions that the teacher judged their responses to be incorrect and they became hesitant. The teacher eventually had to instruct the students to repeat what they had said before. The purpose of the video record appears to be that of showing how children can learn about decomposition by working with so-called concrete objects and a 100 square to produce statements like "13 is one 10 and three 1s." With the multiple takes requested by the camera operator it would have been possible to edit the footage into a shot-reverse shot sequence of images so that the dialogue between the teacher and students appeared to flow smoothly. However, for the purposes of research the video record is rather poor.

7.4 Afrikaans-medium public school, Grade 2

The video record considered in this Section consists of video recordings of: (1) a teacher interacting with students working in a small group; (2) the students performing a sequence of movements around a large "clock" in response to the teacher's instructions; (3) a series of interviews with eight of the students; and (4) an interview with the teacher. The speech of the various participants in the video recordings has been transcribed and is used in support of the description and analysis generated here.

We shall begin our discussion with a brief, initial description of features of the pedagogy, drawing attention to both discursive and non-discursive features. An initial reading of the pedagogy suggests that three features are dominant across elements (1) to (4) of the archive: (i) the production of sameness with respect to the non-discursive features of pedagogic activity, (ii) (apparent) difference with respect to the discursive and (iii) the production of the student as pleasured.

7.4.1 The production of sameness

With respect to dress, students exhibit strong uniformity: all the male students wear black short pants, grey shirts and go barefoot; the female students wear blue tunics, white shirts and black school shoes. All the students use computer fanfold paper on which to write down solutions using wax crayons. All students have access to a calculator which they use to check their solutions; all the calculators are of the same make and model. Within groups students all work on the same set of problems. The groups are constituted with reference to "ability levels" so that they are homogeneous. According to the teacher three different "ability levels" are used: levels 1, 2 and 3 where level 3 is the highest level.

Ons verdeel ons groepe in drie groepe wat dan ook in .. er .. drie ontwikkelings vlakke is kan jy sê … die stadige groepie .. groepeer ons saam in 'n groepie en dan .. die vinnige kinders is weer saam sodat hulle mekaar stimuleer .. en .. er .. sodat hulle … ook hulle eie selfbeeld kan in die prosess kan ontwikkel kan sien maar dit is nie net ek wat sukkel nie .. ek .. er .. maatjies ook en ons … sukkel saam deur hierdie probleem .. en dit is vir ons baie lekker om die probleem op te los .. en dan probeer 'n mens ook aanpas by elke kind se potentiaal .. jy sal by voorbeeld vir die vlak dries sal jy vinniger .. er meer take gee .. jy sal ook .. er .. meer verykunde werk gee terwyl jy met die vlak dries weer .. ag vlak twees weer … (laughs) … terwyl jy met die vlak eens … weer .. meer remidieerende ondersteuning sal gee .. en .. er .. er .. meer vir hulle … er .. hulle basiese begrippe .. beter vestig want dit kan dalk 'n oorsaak wees waarom hulle nog nie so suppel is in hierdie nuwe benadering nie omdat basiese begrippe nog nie goed genoeg vasgelê is nie.

[*We organise our groups into three groups of different developmental levels. The slow children are grouped together—the fast children are also grouped together so that they can stimulate each other—so that their self-images can develop, so that they can see that others also struggle and they struggle through a problem together, and that it is very enjoyable to solve a problem. And then one tries to take into account every child's potential. One would, for example, give the level threes more problems at an increased pace. One would also give them more enriching work while one would give the level ones more remedial support and focus more on reinforcing their basic concepts because that may be the reason for their lack of suppleness in this new approach, not because basic concepts have not yet being learned.*]

(Extract from the interview with the teacher.)

Clearly, then, there are marked differences across groups, where the differences are understood in terms of a developmental hierarchy specialising time, text and space: according to their developmental level, each student is placed in a level-specific group (space), given tasks consonant with the particular level (text), and given the time to work at their own pace (time) …

[E]lke kind het sy eie werkstempo, het sy eie ontwikkelingstempo, en hierdie nuwe benadering .. maak (indistinct because a door bangs; the teacher pauses) … … (continues) en hierdie nuwe benadering maak dan voorsiening vir elke een se ontwikkelingsvlak wat dit so wonderlik maak.

[*Each child has their own pace at which they work, their own developmental pace, and this new approach to teaching makes provision for each child's developmental level, which is what makes the approach so wonderful.*]

(Extract from the interview with the teacher.)

Groups consist of four students. The students work at individual tables but four of these are moved together and covered with a tablecloth so that they form a communal working surface for the group. The cloths covering the tables are all blue and white, some of which are striped while others show white polka dots on a blue background. The cushions that are used on the floor are covered in a similar fashion: white polka dots on a blue background, or blue and white stripes. The same fabric is used for the classroom bags which hang over the backs of chairs.

In the single recorded instance of whole class teaching it is clear that all the students participating in an exercise have to produce the same "inscriptions" in the same order: the students are positioned around a large "clock" (made of red fabric) so that each student is at one of the twelve numbers, and they are requested to move "earlier" or "later" a specified number of "hours"; here there is little possibility of students not producing what is required since even those students who do not know how to read a twelve-hour analog clock are forced into the correct place in order to keep their position in the group. The only way in which a student can produce something different from what is required is to step outside of the task; that is, to disrupt the activity.

7.4.2 The production of difference

The range of differences made manifest in the classroom is tightly circumscribed and appears to be limited to pen-cases and school-bags and the chains of signifiers (written and verbal) that students are required to produce. The latter, while a difference, is a *required* difference: students have to produce different inscriptions (chains of signifiers) from other students as well as different orderings of inscriptions. This requirement is expressed clearly, with respect to groupwork, by a student who appears to be one of the most competent:

Int: As julle .. help dit vir jou per .. er .. er. As julle so werk in die groepies, wat .. wat .. wat sê julle vir mekaar? Hoe .. hoe werk dit in die groepe?

[*When you work in groups, what do say to one another? How does it work in the groups?*]

S1: Party keur baklei ons 'n bietie oor die som ... en ... ons somme moet verskil ... en ... die antwoord moet almal die selfde wees.

[*Occasionally we argue a bit about a solution. Our methods have to be differ and the final answers must be the same for everyone.*]

(Extract from the interview with the students.)

Students are also encouraged to produce more than one solution to a problem so that this difference is realised not only across students but within the texts produced by individual students:

T: (addressing a different student in the same group, sitting alongside S1) Er .. er .. Roedolfie, wil jy nie nou vir ons gou-gou wys hoe het jy hierdie nommer een gedoen het nie?

[*Roedolfie, don't you want to quickly show us how you solved number one?*]

S2: (student shuffles around, pointing at his page of work) Ja .. (teacher interjects)

[*Yes ...*]

T: (interjecting) Jy het hom op twee maniere gedoen sien ek.

[*I see that you solved it in two different ways.*]

S2: (student continues; points at different solutions on his page) .. so, so, so .. (teacher interjects)

[*Like that, that, that ...*]

T: (interjecting) Nou wys vir ons .. Het jy hom op drie maniere gedoen? (indicating approval) Mmm! Nou toe, wys hulle vir ons.

[*Now show us. Did you solve it in three different way? Mmm! Now then, show us your solutions.*]

(Extract from video record of teacher-student interaction.)

A similar difference between students is produced via work at the computers: students are required to work through the problems posed but are not allowed to proceed by the software unless they are able to solve the problems; different students will proceed through the sequence of problems at different rates.

7.4.3 The pleasured student

A recurring element in the speech of the teacher, students and interviewers in the archive under discussion here is that of references to pleasure. That pleasure is an index of happiness is perhaps a commonsensical assertion today, perhaps so commonsensical that it goes unnoticed when explicit and is most present as a concern when it is suspended or absent. What could be more natural than the seeking out of pleasure (life, liberty and the pursuit of happiness)? And if in the context of a classroom pleasure is an index of successful teaching and learning, should we not attend to those features of pedagogy through which pleasure is enhanced or suspended so that we might improve teaching and learning? But, given that the class in focus here is a Grade 2 class, might we not say that there is nothing unusual or interesting in the frequent references to pleasure, that it is part of the pedagogic discourse of initial phase teaching and that a concern with pleasure surfaces in interactions with young children as a matter of course? We can answer such a potential dismissal of our interest in pleasure by way of a reference to Althusser's famous ISAs paper: it is precisely in its external material features that ideology functions, through which it says what it cannot (and must not) say explicitly. The most mundane and apparently uninteresting, everyday object or ritual—through which the social maintains its semblance of consistency—is the space of the smooth functioning of ideology, of its occlusion as merely the normal state of things (Althusser, 1971).

The video record of actual teaching opens with a shot of the teacher interacting with a student in which the following series of verbal exchanges take place:

T: Gerhard, ek sien jy's al klaar met jou berekeninge. Kan jy vir my wys hoe jy hierdie probleem opgelos het? Was dit 'n lang probleem?

[*Gerhard, I see that you have completed all your calculations. Can you show me how you solved this problem? Was it a lengthy problem?*]

S1: Ja juffrou.

[*Yes Miss.*]

T: Was dit lekker?

[*Was it enjoyable?*]

S1: Ja juffrou.

[*Yes Miss.*]

T: Het jy daarvan gehou om hom op te los?

[*Did you enjoy solving the problem?*]

S1: Ja juffrou.

[*Yes Miss.*]

(Extract from video record of teacher-student interaction.)

The teacher was examining the solutions produced by the students in their groups and could see that S1 had successfully solved all the problems. She immediately sought to associate pleasure with both the problem ("Was dit 'n lang probleem? […] Was dit lekker?") and its solution ("Het jy daarvan gehou om hom op te los?"). The word "lang" [lengthy] is often used in schooling as a synonym for "complex" and "difficult", so that the teacher's description of the problem as "lang" might be read as an attempt at associating mathematical complexity (and therefore also the implied difficulty of mathematics) with pleasure. The pleasure of the student is taken as an indicator of the success of the pedagogy since the student's pleasure is presumed to arise directly from successful problem solving. And successful problem solving implies the success of the teacher. However, returning to the association of complexity and difficulty with pleasure, we note that such a relation has the structure of a speculative identity. In general, that which is complex and difficult is precisely a source of unpleasure for the subject, that is, unless s/he has (or is judged to have) the resources for achieving success. Given that the pedagogy apparently presupposes that the student is always-already in possession of the resources for achieving success, it is not surprising that the student is called upon to declare the learning of mathematics as pleasurable for to do otherwise would be to challenge that presupposition.

If we turn to the interviews conducted with students we once again find an emphasis on the pleasure of the student. Eight students were interviewed and the interviewer appeared to be interested in eliciting statements from the students in which they would testify to having experienced the learning of mathematics as pleasurable. Below we extract from the interviews the questions posed by the interviewer in which she directs each student's attention towards pleasure.

Addressing 1st student; male:

1. Gerhard, vertel my van jou wiskunde klas. Hou jy van wiskunde

   [*Gerhard, tell me about your mathematics lessons. Do you enjoy mathematics?*]

2. Hoekom hou jy van wiskunde?

   [*Why do you enjoy mathematics?*]

3. En .. en as julle van die .. er .. er .. as julle nou 'n probleem gekry het en julle moet na ... een van die ander ... na die rekenaars toe gaan of na die horlosie to gaan, wat is vir jou die lekkerste?

   [*And when you get a problem that requires you to use to the computer or the clock, which do you most enjoy?*]

4. Hoekom? (Here the interviewer is responding to a statement of the student in which he claimed that working on the computer was most pleasurable).

   [*Why?*]

Addressing 2nd student; female:

5. Hoekom hou jy van wiskunde?

   [*Why do you enjoy mathematics?*]

6. Okay .. en .. en van al die goeters in die klas wat daar beskikbaar is, hoe .. er .. van wat hou jy die meerste?

   [*Okay, and of all the resources available in the classroom, which do you enjoy most of all?*]

7. Hoekom? (Here the interviewer is responding to a statement of the student in which she claimed that working on the computer was most pleasurable).

   [*Why?*]

Addressing 3rd student; male:

8. Roelof! Okay Roefol, hoekom hou jy van wiskunde?

[*Okay Roelof, why do you enjoy mathematics?*]

9. En is dit vir jou lekker om saam met jou .. maatjies in 'n groep te werk? ...

   [*And do you enjoy working in a group with your friends?*]

10. Hoekom? Wat maak julle? ... ... (Here the interviewer is responding to a statement of the student in which he claimed that working in a group was pleasurable).

   [*Why? What do you do?*]

Addressing 4th student; male:

11. Okay, van wat hou jy die meerste in die wiskunde klas?

   [*Okay, what do you most enjoy most of all in the mathematics lesson?*]

12. Hoekom hou jy van die mee .. rekenaars?

   [*Why do you enjoy the computers?*]

13. Is dit vir jou lekker om aleen te werk of om in groepies te werk?

   [*Is it more enjoyable for you to work individually or in a group?*]

14. Hoekom is dit vir jou die lekkerste?

   [*Why is that most enjoyable?*]

Addressing the 5th student; male:

15. Okay. En sê vir my .. er .. as julle .. er .. wat is vir jou die lekkerste: om aleen te sit en werk .. of om in groepies te werk?

   [*What is most enjoyable for you: to work individually or to work in a group?*]

16. Okay. En .. en .. die manier wat Juffrou die klas gee, is dit vir jou lekker?

   [*And the way in which Miss teaches, do you find that enjoyable?*]

17. Hoekom is dit lekker? Wat maak dit anderste? ...

   [*Why is it enjoyable? What makes it different?*]

Addressing the 6th student; female:

18. Cindy, sê vir my hoekom jy van wiskunde hou.

   [*Cindy, tell me why you enjoy mathematics?*]

19. Hoekom is dit lekker?

   [*Why is it enjoyable?*]

20. Okay. Waarvan hou jy die meerste?

   [*Okay. What do you enjoy most?*]

21. Hoekom? (Here the interviewer is responding to a statement of the student in which she claimed that working on the computer was most pleasurable).

   [*Why?*]

Addressing the 7th and 8th students, interviewed as a pair; males:

22. Matthew ... ... Okay ... vertel my van julle wiskunde. Hou julle van wiskunde en hoekom hou julle van wiskunde?

   [*Matthew. Okay. Tell me about your mathematics. Do you enjoy mathematics, and why do you enjoy mathematics?*]

23. En waarvan hou julle die meerste?

[*And what do enjoy most?*]

24. Hoekom? (Here the interviewer is responding to a statement of the students' in which they claimed that working on the computer was most pleasurable).

[*Why?*]

25. B .. jy kan seker daar heerlik sit en kroep daar?

[*You can probably sit and copy nicely*[17] *there?*]

26. Hoekom nie? (Here the interviewer is responding to a statement of the students' in which they claimed that it was not possible to cheat, contradicting her suggestion that they might enjoy the computers because they could cheat).

[*Why not?*]

Of the eight students who were interviewed *all* indicated that they enjoy mathematics and working at the computers, and that mathematics and the computers "made them clever". It appears from the video record of the classroom activity that student S1 is marked out as being the most competent student; he is also the first student to be interviewed and asserts very confidently that the importance of mathematics resides in the intrinsic enjoyment produced by it and that it makes one clever:

Int: Dink jy dis nodig dat .. al die kinders moet wiskunde leer?

[*Do you think that it is necessary for all children to study mathematics?*]

S1: Ja.

[*Yes.*]

Int: Hoekom is dit.

[*Why is that?*]

S1: Want dis lekker en dit maak jou slim.

[*Because it is enjoyable and it makes one clever.*]

(Extract from the interviews with the students.)

All subsequent students interviewed produced similar statements in response to the interviewer's questions:

S2: Want dit is vir my baie lekker en ek word baie slim daarmee.

[*Because I find it very enjoyable and I become very clever.*]

S3 Dit maak jou slim en dis baie lekker.

[*It makes one clever and it is very enjoyable.*]

S4: Want .. op die rekenaars is daar mooi prentjies en dit .. maak jou slim.

[*Because there are pretty pictures on the computer and it makes one clever.*]

S5: Want .. dit maak jou slim .. en .. en dit .. party is moeilik en party is net so maklik.

[*Because it makes one clever and some problems are difficult and some are just easy.*]

[17] The interviewer uses the term "heerlik" of which a direct translation into English would be *delicious*. We have translated "heerlik" as *nicely* to conform with the general form of the statement as it would appear in local English, but it is not adequate because the connotation of elicit pleasure that attaches to the particular usage of 'heerlik" here is weakened when "heerlik" is translated as *nicely*.

S6: Want dit maak jou slim en dis baie lekker.

[Because it makes one clever and it is very enjoyable.]

S7: Want dis baie lekker en interesant.

[Because it is very enjoyable and interesting.]

S8: Want … ek het 'n paar keer op dit gewerk toe's ek sommer in 'n japtrap .. nou baie slim.

[Because I worked on it a few times and in a flash I became very clever.]

(Extracts from the interview with the students.)

It would appear that the students have learned to identify pleasure with mathematical competence and also view the computer as a means to realise both mathematical competence and pleasure. The efficacy of the computer in the production of competence and pleasure is not only referenced by the students but, importantly, also by the teacher:

Int: Die rekenaars .. hoekom is die kinders so mal oor die rekenaars?

[The computers … Why are the children so crazy about the computers?]

T: Die rekenaar is 'n finominale hulpmiddel .. in ons klasse .. nie net in wiskunde nie .. in al die klasse .. want .. erm .. met die rekenaar kry 'n mens baie meer reg … as wat jy byvoorbeeld op 'n werkvel .. regkry omdat daar interaksie is tussen rekenaar en kind .. en … er .. die rekenaar laat kinders ook altyd baie positief voel oor hulle self .. daar's geen kompitiese met .. er .. iemand anders nie dit is daai kind self .. die rekenaar gee terugvoer aan 'n kind .. hy .. sê byvoorbeeld vir die kind waneer hy verkeerd was om weer te probeer .. en die .. daar's geen emosionele druk op daai kinders nie .. so hulle leer eintlik speel-speel.

[The computer is a phenomenal aide in our classes; not just in mathematics, but in all classes because one achieves more than with, for example, a worksheet because of the interaction between the computer and child. And the computer allows children to feel positive about themselves: there is no competition with anyone else. The computer gives the child feedback, telling the child, for example, when he was wrong to try again, and there is no emotional pressure on the children so that they actually learn play-play.]

(Extract from the interview with the teacher.)

One of the interesting features of the use of computer software is that the so-called interaction between the software and the student— "interaksie […] tussen rekenaar en kind"—is governed by a rigid set of rules encoded in the programs that constitute the software: there is no space for "negotiation of meaning" with the software; any illegitimate response on the part of the student produces from the software either an implacable silence or an error message, at the very least marking out that which is not legitimate, so that the recognition and realisation rules for the production of legitimate texts appear with greater clarity than in interactions between the teacher and students in an invisible pedagogy. It is little wonder then that students claim that the computer "makes them clever" since "being clever" implies producing legitimate responses to questions and problems, which is a function of having access to and deploying the appropriate recognition and realisation rules. In other words, the computer software functions as an oasis of visible pedagogy inserted into a pedagogy that is otherwise invisible. The pleasure experienced by the students in relation to the computer software is then conceivably nothing more than an expression of relief at being momentarily delivered from a hystericising pedagogic relation—"What is that you really want from me?"—in that the student enjoys the suspension of a subjective condition of unpleasure.

It should be clear from the questions posed by the interviewer that the students' and teacher's declarations of their experiences of pleasure resulting from the problem-centred approach are not incidental or spontaneous, but explicitly elicited by the interviewer for the purposes of dissemination to the television viewing public. Recall that one of our propositions, restated in a number of different places in this work, is that pleasure, and the particular forms it takes, are not spontaneous. Rather, pleasure issues from the moral order in the form of a response to an injunction to enjoy in a particular way.

7.4.4 The contextualising of mathematics

In the this section we take up the issue of what constitutes a relevant "context" via an analysis of a series of teacher-student interactions focused on a task. We start with a discussion of "meaningful contexts" because within this pedagogy students are not explicitly taught but rather have to generate the mathematics ("construct" mathematics) from an engagement with mathematical tasks that reference a "meaningful context."

We see, in the task used in the classroom, that elements of the everyday are recontextualised to constitute a "meaningful context" for the practising of addition, subtraction, multiplication and division: the task describes a mother who purchased marbles which she distributed to three boys. Ensor produces a definition of context that, in its most general form, allows us to begin to consider how we might approach the notion of a "meaningful context" as promoted by the authors of the *Mathematics at work* texts.

> For the purposes of my discussion I shall regard context as that which "contains" an event, a textual production (utterance or action) involving a social relation between at least two participants. Context is thus a particular specialising of relations between subjects which may not be realised simultaneously in space and time.
> [...]
> Any context, I would argue, is an invitation, an evocation, to speak. In this sense it is productive. At the same time it is constraining insofar as it canalises and silences expression. In the way it is constituted, a regulation on speaking and silence is imposed, although by no means absolutely.
>
> Ensor (1999: 87)

Ensor's perspicacious definition draws our attention to the central features of a context: the specialising of social relations that necessarily includes the specialising of language. We see this specialisation very clearly here: in the production of the solution of the task (which consists of a series of problems) we see that the everyday "context" is backgrounded by means of the redescription from the everyday narrative to strings of mathematical inscriptions. For example, the first problem of the task encountered in the class,

> Mama het 96 albasters gekoop,
> waarvan 48 rooi was. Die helfte van die
> getal was groen en die res was blou.
>
> [*Mum bought ninety-six marbles of which forty-eight were red.*

Half of the amount were green and the rest were blue.]

1. Hoeveel blou albasters was daar?

[*How many blue marbles were there?*]

eventually becomes "96 - 48 = 48." However, there appears to be an error in the narrative, making it nonsensical: we have 96 marbles, 48 of which are red; half of the amount is green and the rest blue. Which amount is referred to here? The total number of marbles, 96, or the 48 red marbles? Clearly half of the 48 red marbles cannot be green and the other half blue. It cannot be referring to the 96 if the number of blue marbles is not zero, because the number of red marbles is already half of the total. We know that the number of blue marbles is not intended to be zero because the teacher accepts 24 as an answer. Neither the teacher nor those directing the filming of the interaction draw attention to the nonsensical nature of the task; in fact, later in the video record the task, as it was printed on A4 sheets for the students, is carefully filmed so that all the problems are displayed for the viewer to read, and even later, in the interviews with the students and the teacher, no mention is made of the task. In producing his solution the student appears to have dealt with the error by reasoning as follows: we have 96 marbles, 48 of which are red, leaving 48 marbles remaining, so the number of green marbles must be half of the remaining 48 marbles, and therefore the number of blue marbles must be 24:

S1: (sits down; reads the question) "Mama het ses en negentig albasters gekoop waarvan agt en veertig rooi was. Die helfte van die getal was groen en die res was blou. Hoeveel blou albasters was daar?" Ek het gesê (pointing at his written work): ses en negentig minus agt en veertig.

[*"Mum bought ninety-six marbles of which forty-eight were red. Half of the amount were green and the rest were blue. How many blue marbles were there?"*]

T: (interjecting) Hoekom het jy gesê minus agt en veertig?

[*Why did you say minus forty-eight?*]

S1: (pointing to the question) Want ... Daardie ... Hy vra nou (reading): "Mama het ses en negentig albasters gekoop waarvan agt en veertig rooi was."

[Because ... That ... The question reads (reading): "*Mum bought ninety-six marbles of which forty-eight were red.*"]

T: So jy weet daar is agt en veertig rooi albasters. Nê?

[*Therefore you know that there are forty-eight red marbles. Right?*]

S1: Ja.

[*Yes.*]

T: Goed.

[*Good.*]

S1: Toe sê ek ... toe breek ek .. die twee getalle op ... toe sê ek: (pointing at his written work) negentig minus veertig is gelyk aan vyvtig. Toe sien ek .. as daar ses oorbly .. en ek moet hom met agt minus .. dan gaan dit nie uitwerk nie .. Toe sê ek .. Toe leen ek by die vyvtig, tien, toe's dit veertig. Toe sê ek: sestien minus agt is agt. Toe tell ek veertig plus agt bymekaar .. Toe's dit agt en veertig.

[*Then I said ... then I broke up the two numbers ... Then I said: ninety minus forty is equal to fifty. Then I noticed ... if six is left over ... and I have to subtract eight .. then it will not work out. Then I said .. Then I borrowed ten from the fifty, then it was forty. Then I said: sixteen minus eight is eight. Then I added forty plus eight .. Then it was forty-eight.*]

T: Dink jy jou .. jou .. jou berekeninge was reg?

[*Do you think that your .. your .. your calculations were correct?*]

S1: Ek sal gou kyk. (moves to his calculator; punches in "96 - 48 ="; gets 48 as an answer) Ja .. Dis reg.

[*I'll check quickly. Yes .. it's correct.*]

T: Is hy reg (intonation indicating a statement rather than question). Goed. Kom ons gaan na die tweede een toe.

[*Is it correct. Good. Let's move on to the second question.*]

S1: Nou .. Want .. Die .. Die eerste is een van twee helftes.

[*Now .. Because .. The .. The first is one of two halves.*]

T: Dis reg. Want jy weet nou nog nie hoeveel .. Jy weet nou daar's agt en veertig albasters oor. Nê?

[*That's correct. Because you don't yet know how many .. You know there are forty-eight marbles left over. Right?*]

S1: Ja.

[*Yes.*]

T: Nou weet .. Nou weet jy nog steeds nie hoeveel blou albasters is daar.

[*Now you still don't know how many blue marbles there are.*]

S1: Ja. Toe sê ek: agt en veertig – dis daardie eene (pointing at his written work) – gedeel deur twee – want nou's daar hoeveel groen .. er .. daar is .. er (starts reading the question): "Die helfte van die getal was groen en die res was blou."

[*Right. Then I said: forty-eight – it's that one – divided by two – because now there are how many green .. er ..there are .. : "Half of the amount were green and the rest were blue."*]

T: Nou hoekom het jy .. as hy sê "die helfte" nou hoekom het jy ge .. ge .. gesê "gedeel deur twee"?

[*Why did you .. if it reads "half of" why did you say "divide by two"?*]

S1: Want, nou as jy nou die agt en veertig vat dan kan jy sê agt en veertig gedeel deur twee en .. (teacher interjects)

[*Because, if you now take the forty-eight then you can say forty-eight divided by two and ..*]

T: (interjecting) Sal dit dan vir jou die helfte gee?

[*Will that give you half?*]

S1: Ja. Toe breek ek hom op toe's dit veertig gedeel deur twee, toe's dit twintig. Toe's daardie agt nog oor, toe sê ek agt gedeel deur twee is gelyk aan vier. Toe sê ek .. Toe tel ek dit bymekaar, toe's dit vier en twintig.

[*Yes. So I broke it up, then it was forty divided by two, then it was twenty. Then that eight was still left over, so I said eight divided by two is equal to four. Then I said .. Then I added, then it was twenty-four.*]

T: Vier en twintig wat? (intonation suggests a demand rather than a question)

[*Twenty-four what?*]

S1: er .. er .. blou albasters?

[*er .. er .. blue marbles?*]

T: Mooi! Goed, nou gaan ons na nommer twee toe.

[*Lovely! Good, now we can move on to number two.*]

(Extract from video record of teacher-student interaction.)

So, what is a "meaningful context" here? How is it that teacher, student, researchers and video operator all apparently ignore the nonsensical elements of the narrative? This is hardly surprising for what might be thought of as the "context" here—the narrative about the marbles—is not, in terms of our initial definition, the context. The context generated by the narrative in combination with a series of questions. While it is commonplace in mathematics teaching for the "context" of a problem to be thought of as the extra-mathematical referent (the situation described in the narrative or story) that is an inadequate conception because it is necessary to include the questions that refer to the story as crucial elements of the "context": what are the questions if not themselves indexes of evaluative criteria? So, having begun our discussion with Ensor we arrive again at Bernstein's account of the specialisation of time, text and space as a product of the evaluative rules of the pedagogic device; the specialisation emphasised by Ensor is realised through the evaluative rules, in the transmission and acquisition of criteria for the production of legitimate utterances.

7.4.5 Bernstein's imaginary subject and the regulative discourse

There is an additional feature of context, not suggested in Ensor's definition, but which emerges in Bernstein's discussion of the recontextualising rules of the pedagogic device, namely, what Bernstein calls the *imaginary* in the production of pedagogic discourse:

> Pedagogic discourse is a principle for the circulation and reordering of discourses [...] for delocating a discourse, for relocating it, for refocusing it, according to its own principle.
>
> Now in this process of delocating a discourse (manual, mental, expressive), that is, taking a discourse from its original site of effectiveness and moving it to a pedagogic site, a gap or rather a space is created.
>
> As the discourse moves from its original site to its new positioning as pedagogic discourse, a transformation takes place. The transformation takes place because every time a discourse moves from one position to another, there is a space in which ideology can play. No discourse ever moves without ideology at play. As this discourse moves, it is ideologically transformed; it is not the same discourse any longer. I will suggest that as this discourse moves, it is transformed from an actual discourse, from an unmediated discourse to an imaginary discourse. As pedagogic discourse appropriates various discourses, unmediated discourses are transformed into mediated, virtual or imaginary discourses. From this point of view, pedagogic discourse selectively creates *imaginary subjects*. (Bernstein, 1996: 47; italics in the original.)

If pedagogic discourse in its materiality is indicated at the level of texts and practices produced in its name, then the specific tasks selected, or created, for the transmission and acquisition of mathematical contents must be realisations of pedagogic discourse. It follows from this that such texts are implicated in the production of the imaginary subject referred to by Bernstein.

To get from the regulative discourse to Bernstein's "imaginary subject" created by pedagogic discourse we should introduce Lacan's definition of the signifier—"a signifier is that which represents the subject for another signifier" (Lacan, 1977b: 316)—that announces an indissoluble link between the subject and the signifier. We can understand this definition of the signifier by considering the student within pedagogic discourse. In the particular instance under consideration here, for example, the student is situated, or positioned, in a specific group of subjects to which is distributed a specific specialisation of time, text and space. Such positioning demands a specific description of the student, marked by a specific field of signifiers. For whom is the student so described or, differently stated, to what does the student's signifier refer? Only to the symbolic order, the field of (other) signifiers (of pedagogic discourse). This is demonstrated in the teacher's opening remarks of the interview with her:

T: In hierdie nuwe benadering .. moet 'n mens as onderwyser bereid wees om baie geduld te .. hê .. want dis 'n baie lank prosess .. en al die kinders het werklik baie gedifferensieerd .. want elke kind het sy eie werkstempo, het sy eie ontwikkelingstempo, en hierdie nuwe benadering .. maak (indistinct because a door bangs; the teacher pauses) ... (continues) en hierdie nuwe benadering maak dan voorsiening vir elke een se ontwikkelingsvlak wat dit so wonderlik maak.

[*In this new approach .. one must, as a teacher, be prepared to exercise great patience .. because it is a very lengthy process .. and all the children have really very differentiated ... Because every child has their own working pace, have their own developmental pace, and this new approach .. makes provision for everyone's level of development, which is what makes it so wonderful.*]

(Extract from video record of teacher-student interaction.)

Here we should note that the individualised pedagogic has its own signifier. However, as we will soon see, the signifier representing the subject is not as autonomous as the teacher's statement suggests. In the particular instance of pedagogy under discussion here we witness, in the interaction between S1 and the teacher, an attempt to demonstrate the characteristics of the ego-ideal to, at least, the other students in the group: the teacher does little to mask her pleasure of the apparent success of S1 and what is interesting is that even though she believes that the student's solutions are sound, she proceeds to interrogate him closely. The "I" who features so prominently[18] in the student's responses to the teacher is not just the "I" referring to the subject, but the ego-ideal. By means of her interrogation of S1 the teacher is demonstrating to the particular student as well as the others how it is that they should produce legitimate solutions. When she shifts her attention to S2, however, she detects an anomaly that displeases her:

S2: Ek het ses en negentig gevat minus agt en veertig ... is gelyk aan. Ek het ook ses en negentig minus veertig is gelyk aan ses en vyftig. Toe vat ek ses en vyftig minus hierdie agt wat oorgebly het toe's dit agt en veertig. En hier ... hierdie een ... (pointing at the solution of the next problem) (teacher interjects)

[*I took ninety-six minus forty-eight ... is equal to. I also had ninety-six minus forty is equal to fifty-six. Then I took fifty-six minus the remaining eight, then it was forty-eight. And this one ...*]

T: (interjecting) Nou .. nou jou ander manier?

[*Now .. now your other method?*]

S2: Toe's dit .. toe vat ek weer ses en negentig minus agt en veertig is gelyk aan. Toe vat ek negentig minus vyftig is gelyk aan veertig. Toe's it .. toe's it .. toe's it minus .. toe's it minus twee ... en hierdie (teacher interjects)

[*Then it's .. then I once again took ninety-six minus forty-eight is equal to. Then I took ninety minus fifty is equal to forty. Then it was .. then it was .. then it was minus two ... en this ..*]

T: (interjecting) Nee, gee vir ons eers die antwoord, hoe het jy by die antwoord gekom? Daai minus twee beteken nou nog vir my niks nie. Hoe't jy toe gedink om by die antwoord te kry?

[*Now, show us the answer first. How did you arrive at the answer? That minus two means nothing to me.*

18 The student uses the word "ek" (that is, "I") forty-one times.

How did you reason to arrive at the answer.]

S2: (continuing) toe vat ek hierdie vyftig. Toe minus .. toe weet ek dit is 'n min ... jy moet hierdie getal minus toe's it .. toe .. toe .. toe vat ek vyftig minus twee is gelyk aan agt en veertig.

[*then I took this fifty. Then minus .. then I knew that it is a min ... one must subtract this number then it's .. then .. then .. then I took fifty minus two is equal to forty-eight.*]

T: En hoe was die tw .. derde manier? Jy's sommer 'n slimkop om dit op drie maniere te kon doen, jong!

[*And how was the third method? You're a really smart to have done it in three different ways!*]

S2: Toe's dit agt en veertig gedeel deur .. twee ...is ge .. is gelyk aan. Toe vat ek veertig gedeel deur twee is gelyk aan twintig. En toe vat ek agt ... gedeel deur twee is gelyk aan vier. Toe vat ek twintig gelyk aan vier is gelyk aan vier en twintig.

[*Then it was forty-eight divided by .. two .. is equal to. Then I took forty divided by two is equal to twenty. And then I too eight ... divided by two is equal to four. Then I took twenty equal to four is equal to twenty-four.*]

T: Baie mooi.

[*Very good.*]

(Extract from video record of teacher-student interaction.)

In his calculations the student produced an intermediate calculation that violated the specialisation of text by writing down the equation "6 - 8 = -2" which is correct, and which allows him to produce the same final answer as S1. The teacher marks out the production of "-2" as meaningless ("Daai minus twee beteken nou nog vir my niks nie." [*That minus two means nothing to me.*]), and it is meaningless only because it disrupts the developmental sequence supposed in the pedagogic discourse: a Grade 2 student cannot be using negative integers in calculations. (We should note that a disruption of the specialisation of text has the immediate consequence of disrupting the specialisation of time and space as well.) Here, even though the student's solution is, in general mathematical terms, correct, it is incorrect precisely in that it disrupts the particular specialisation of time and text, so that even though this student's solution might be thought of as more "advanced," his work cannot serve as an exemplary text. The teacher does, however, express pleasure at the fact that the student produced three different solutions to the problem rather than at his serendipitous discovery of negative integers because the production of different solutions for a single problem is a characteristic of the ego-ideal while the use of negative integers is not.

This disturbance of the pedagogic discourse alerts us to another interesting feature. From the description of the manner in which sameness is produced in this pedagogic context we cannot but be struck by the strong control of the students by the teacher and the strict production of uniformity. Yet one of the central characteristics of the student ego-ideal within the pedagogic discourse is that of a free, creative, autonomous subject who learns more successfully because s/he is no longer caught in the web of authoritarian injunctions. The strong indicator of the autonomous subject is the realisation of texts that display the solutions to problems, the procedures for which have not been prescribed by the teacher. The difference in the teacher's reactions to S1 and S2 demonstrates that the recognition of the moment of emergence of the autonomous subject is the true moment of its loss, and this is what S2 experiences: he must, ultimately, surrender any autonomy to become a legitimate "autonomous" subject.

Through this example we can understand the Lacanian subject as that which, while "represented" by the signifier, is produced by the *failure* of representation: the subject is the excess which escapes signification and this excess is produced by the very attempt at signification. It follows that the Lacanian subject is never a "subject position," the latter is instead an attempt to deal with the trauma of the alienation of being that inheres in language. The positioning of the subject is therefore always "imaginary." We should not fail to notice the extension of the range of Bernstein's "imaginary" beyond pedagogic discourse implied here: the existence of the signifier presupposes the subject and so *all* discourse, whether construed as mediated or not, produces "imaginary subjects" as "subject positions." Conceived of in this way, Bernstein's argument apropos the production of "imaginary subjects" in pedagogic discourse links with the Lacanian notion of symbolic identity (the multitude of "subject positions") produced by fantasy. In other words, Bernstein's *imaginary* points to Lacan's *fantasy*, where fantasy is the *mediator* between the "formal symbolic structure and the positivity of the objects we encounter in reality" (Žižek, 1994: 7). It follows from this that pedagogic discourse always relies on a phantasmatic background and, therefore, so does "context."

The phantasmatic mediation of ideology is nothing other than the teaching of what and how to desire. In Bernstein's terms, it is the transmission and acquisition of recognition and realisation rules as they pertain to the regulative discourse. This brings us to another feature of fantasy: its thoroughly *intersubjective structure*. "Desire is the desire of the Other" (so goes another of Lacan's aphorisms) since the fundamental question regarding desire is not "What do I want?", but "What does the Other want from me?" and it is fantasy that provides an answer to this question. The point of identification in the subject's narrative is generally never fully with "itself" but rather strains in the direction of the ego-ideal, that phantasmatic semblance of the subject that is presumed to be enjoyed by the symbolic order where "truth" and meaning are presumed to be guaranteed.

7.5 English-medium public school on the Cape Flats, Grade 2

As with the other classes discussed above, the students participating in the lesson we discuss here were arranged in groups. A number of features of the pedagogy are worth highlighting. First, the rapidity with which the extra-mathematical is dispensed with is interesting given that much is made of the importance of the use of extra-mathematical referents by the authors of *Mathematics at work*, of whom the teacher here, Piet Human, is one. Second, even though it is clear that we can describe the pedagogy as a competence pedagogy which, by definition, focuses on presences rather than absences in the acquirer's utterances (Bernstein, 1996), we see that a strategy for revealing and focusing on absences is employed as a central pedagogic resource. This situation raises questions about Bernstein's definitions of competence and performance pedagogies which we shall address in the conclusion to this Chapter.

7.5.1 The excision of the extra-mathematical

The lesson began, as shown in the extract below, with a word problem referencing the extra-mathematical, posed verbally by one of the authors of the *Mathematics at work* texts (Piet Human) who was teaching the class.

PH: I'm buying six little ice-creams, called mini-ice-creams, twenty-eight cents each. How much is that going to cost me? And you don't want ... And you don't tell me what the answer is. You share it with your friends when you have finished. But give them chance to finish too. Okay?

(15 seconds elapse)

PH: It's six ice-creams, and how much do they cost each of them?

S: (Students' speech indistinct)

PH: Twenty-eight cents each.

The students were allowed a brief amount of time to solve the problem (6 × 28) after which a similar problem (23 × 49), supposedly of a greater degree of difficulty, was posed by Human who recorded some aspects of the second problem on the chalkboard.

(35 seconds elapse during which time PH writes the following on the chalkboard.)

23 big ice-creams

49c each

PH: If you have finished that one (referring to the first problem), if it was easy, there's another one on the board. You can start working on that one now (pointing at the chalkboard).

When viewing the video record of the lesson it is noticeable that the extra-mathematical referents were rapidly discarded as the lesson proceeded. From the initial statement of the first problem, "I'm buying six little ice-creams, called mini-ice-creams, twenty-eight cents each. How much is that going to cost me?", Human moved to "It's six ice-creams, and how much do they cost each of them?", followed by "Twenty-eight cents each.," in which we see that the last two utterances remove the act of buying as well features of the extra-mathematical part of the description of the ice-cream ("little ice-creams"; "mini ice-creams"), leaving only that which is essential to the calculation: 6 ice-creams at 28c each. The extra-mathematical signifiers remaining could not be dispensed with because they encoded the operation to be performed on the numbers (multiplication). The next problem was stated in writing as simply "23 big ice-creams" // "49 cents each," so that the form of expression was even closer to the arithmetical form of expression: "23 × 49." A short while later Human introduced a sheet containing multiplication problems to the class, a copy of which was given to each student. No further reference was made to the extra-mathematical in the lesson (see Figure 7.1).

4 x 9	8 x 8
7 x 9	6 x 7
4 x 8	5 x 9
8 x 7	9 x 8
7 x 7	9 x 6
8 x 9	9 x 9
10 x 8	11 x 11
3 x 40	12 x 10
30 x 50	4 x 400
400 x 60	80 x 70

Figure 7.1: Human's multiplication problems

We therefore see a rapid transformation of the problems presented in a verbal narrative form to a form that describes the objects—ice-creams—in terms of two numbers written on the chalkboard, which in turn gives way to a series of multiplication problems expressed in only arithmetic terms. The transformation of forms of expression effects a redescription which excises the extra-mathematical activity and its agent (shopping and the "I" of the initial problem statement) and simultaneously introduces the appropriate focus and form for the prioritising of arithmetic calculation. In the next Section we will see how the "I" comes to aligned with mathematics rather than the extra-mathematical. This might be described as the production of a metaphorical relation between extra-mathematical and mathematical expression with respect to both content and subjectivity.

The sequence of transformations tacitly introduces and transmits specific regulations on language from which the students' "construction" of mathematical rationality takes its cue. Starting from a form of expression that weakens the classification between mathematics and the extra-mathematical, the class ends up working with and producing a form of expression that is strongly classified with respect to mathematics.

7.5.2 Revealing absences in the acquirer's knowledge

After the students worked on the first two problems dealing with the purchase of ice-creams, Human raised a question about the manner in which the calculations were done. He picked out a student who he noticed had counted on his fingers while struggling to calculate of the product of 6 and 8.

PH: (Addressing the class) I saw some of you working on your fingers. Nothing wrong with that. But what were you doing? (PH pointing at a male student) You were working on your fingers. Were you doing six times eight?

S: (Student, smiling, nods affirmatively)

PH: Six times eight? What were you doing on your fingers?

S: I was .. I was counting in sixes eight times.

PH: Eight times.

S: And so I .. so I got I counted sixes in eight times so I got thirty-six, so the answer was wrong.

PH: I see. But what were you doing with your fingers? Trying to work out how much eight sixes is?

S: Yes.

PH: (Addressing the class) Ah, ah. Who else did it on their fingers?

Having persuaded the student to confess the failing of the method he employed, Human turned back to rest of the class, attempting to get them to agree that the method of counting on their fingers to calculate products was unstable.

PH: (Addressing the class) Is that the easy way to do it? Or is that a difficult way?

A few of the students argued that counting on their fingers was helpful to which Human responded by pointing out that not all of them counted on their fingers.

S: Yes, yes, because if you count then .. If you don't use your fingers then you forget that how much you counted up to. But now if you count on your fingers then you know how much times you must count up to.

PH: Okay. But .. but would it .. would it not be better if we just know six times eight is forty-eight?

S: (Students remain silent, staring at PH.)

PH: Some of you did not count on your fingers. Did some of you just know .. six .. six eight is forty-eight?

A number of students indicated agreement with the assertion contained in the last question by nodding, and Human then played up the mathematical utility of being able to calculate products easily on the basis of the products the students already know the answers to.

PH: We are going to work on that. You see that it would be very easy if we have to do a problem like this .. and six times twenty .. and six times eight and we .. we just know that six times twenty is hundred and twenty, or we can work that out very quickly. And we can work out very quickly that six times eight is forty-eight. That would be nice. So we are going to work on that.

In the series of exchanges between himself and the students Human marked out a common method used by the students as unstable. He also produced a distinction between more successful methods ("just know" and "work out very quickly") and the unstable finger counting method. The distinction also refers to the students both inter- and intra-subjectively, distributing both knowledge and ignorance to all students: to the extent that a student "just knows" some products but not others, the distinction operates intra-subjectively; as distinguishing between students who "just know" a particular product not known by a peer, the distinction operates inter-subjectively. Once we have described the operation of the distinction in this way it is easy to see that none of the students escape being marked as ignorant even as they are being marked as knowledgeable.

Following the achievement of the distribution of ignorance to all students, Human introduced the sheet of problems shown in Figure 7.1 of Section 7.4.1 above. He once again contrived to emphasise absences in the form of the ignorance of the students.

PH: Now you must listen very carefully. What I want you to do is to look at those little sums and you must check which of them you don't know the answers for. So some of them ... What .. what is four times nine?

S: Thirty-six.

PH: Thirty-six. Okay. So that's the first one on the sheet. So, when you get your sheet ... and you just know four times nine is thirty-six, you ignore that one. You hear me? You ignore the sums that you already know. You try to pick out those that you do not know the answer for. [...] You must circle the ones that you can not do immediately. Okay? And then you draw a circle around it. That's all you are going to do. You are just going to draw circles around the sums that you can not immediately do. Okay? [...] Each of you have to mark about three or four and then I'll tell you what to do after that.

From the extract of exchanges between Human and the students it is clear that the latter were required to attend to only what they did not know and ignore the "sums" they could do. In performance pedagogies absences are usually marked as such by the teacher after reviewing a student's response to problems in order to either insert what is absent or to get the student to do so. The difference from that practice in the strategy used by Human at this point is that the absences are expected to be revealed by the students themselves before they work on problems and their task will be to fill in those absences.

PH: Now what you are going to do is the following. You are going to take turns. So one of you is going to tell the others: "Look chaps, I'm having trouble with this one." [...] Then you tell the others: "I have a problem with nine times six. Do any of you know what nine times six is?" Then you listen to the others. But now, be careful. You know, we sometimes forget these things. I always have a problem with six times seven. How much is six times seven?

S: Forty-two.

PH: Forty-two. But I don't remember it like that. Who can give me a plan? If I have forgotten six times seven, who can give me a plan to remember it again? Or to get that answer again? Anybody.

S: (different student) I say five times six and two times six.

PH: He says that when he has forgotten six times seven, he'll do this. He'll say five times six. That's thirty. And two times six. That's twelve. That gives forty-two. Who can suggest another plan for six times seven?

S: (different student) I say six times six is thirty-six and six times one is six.

PH: You know how I always do it? I know three times seven is twenty-one. And then six times seven ... How do you think I get that?

S: (different student) Three times seven is twenty-one and then you say twenty-one times two is forty-two.

PH: Yes! So there we have different plans for six times seven. What I want you to do now in your groups is you take any one of those table questions. Any one. One of those that you've circled. And then you talk about plans to get the answer. Plans like these we've been talking about for six time seven. Is that okay? Okay. Get going! Make plans!

The rest of the lesson was taken up by students formulating "plans" to solve multiplication problems with Human inviting them to explain their "plans" to the class.

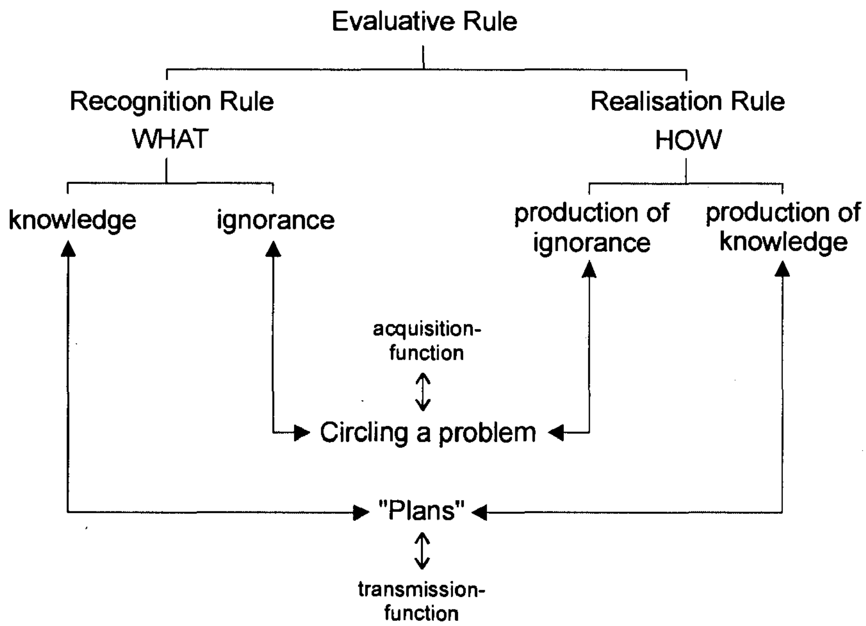


Figure 7.2: The relationship between knowledge and ignorance as structured by the evaluative rule

Human clearly weakened the classification of the hierarchical rules, flattening out the hierarchical relation between himself and the students and as well as such relations between the students. In that way the students were enabled to take on both transmission- and acquisition-functions. However, the difference between what is and what ought to be the case with respect to the state of the students' knowledge is drawn out sharply by the students' marking of the indicators of their own ignorance in the form of circled problems. With this the ego-ideal emerges into view: the circled problems represent both the point from which the students recognise their failure as well the point from which they can view themselves as likeable if they replace the circled problem with the acquisition of a "plan." These two aspects of the ego-ideal are, with respect to the pedagogic subject, correlative to the split within the recognition and realisation rules, and between the knowledge and ignorance (Figure 7.2 shows the structuring of the split).

7.6 Summary

From our analysis of the empirical instances of problem-centred approach teaching and learning we note immediately that the everyday referents contextualising the mathematical tasks are rapidly dispensed with. Further, in many cases, the extra-mathematical contexts do not really provide pedagogic subjects with insights into the mathematics content they are meant to acquire. From our perspective, the extra-mathematical contexts are resources for starting at the point of imaginary identifications, only to be rapidly negated and substituted by symbolic identifications.

We also found that the advocates of the problem-centred approach were fairly insistent about having pedagogic subjects announce a coincidence of pleasure and mathematics in the activity of pedagogic subjects. In the case of the Afrikaans-medium school discussed in Section 7.4 the coincidence of fun and pleasure is aligned with "cleverness." Here we can see clearly how the signifier "cleverness" is used as a regulative resource to produce the correct ideological orientation, in line with utilitarian moral regulation..

The analysis raises questions, as indicated earlier, about the definition of competence pedagogies, especially around the feature of an evaluative focus on presences rather than absences in the productions of the pedagogic subject. We saw that the exemplary problem-centred approach adept, Piet Human, employed strategies to have pedagogic subjects reveal absences in their understanding of the mathematics content and then required them to negate those absences. By producing a pedagogic context in which there is a coincidence between pleasure and mathematics, the pedagogic subject is persuaded not to experience the revelation of absences (ignorance) at the level of the pedagogic text as alienating. What Human has achieved is the production of a cluster of pedagogic strategies that enable him to reassert the distribution of ignorance to the pedagogic subject as a necessary condition for the possibility of pedagogic activity, but in such a way that the pedagogic modality meets the ideological requirements of the hegemonic regulative discourse. It is our contention that the presence which is evaluated in the pedagogic text produced by the student is actually the subject of the enunciation, while at the level of the enunciated, there is a focus on absences. One of the features of competence pedagogies emphasised by Bernstein—that the pedagogic text to be read *is* the pedagogic subject—does suggest that competence pedagogies focus on the subject of the enunciation and perhaps all that is required in the characterisation of competences pedagogies as focused on presences is the insertion of the word "apparent." That is, evaluation is apparently focused presences in the production of the pedagogic subject.

Chapter 8

The judgements of existence, reflection and necessity in the Problem-centred Approach

8.1 Introduction

From the analyses elaborated in Chapters 6 and 7 it should be clear that the pedagogic modality we are dealing with here confronts the student with tasks, apparently exhibiting weak classification and framing, from which the student is expected to "construct" some or other intended logico-mathematical knowledge. Stated differently, the guarantor of truth is understood to be mathematical consistency, and the function of the student is the revelation of such. To the extent that the authors of the *Mathematics at work* series, following Piaget, place mathematical consistency beyond the social—that is, in logico-mathematical thought as opposed to "social" and "physical" knowledge—there does not exist a social agent who is equal to the task of guarantor of the truth of the mathematical utterances of the student. Hence the suspicion directed at all pedagogic agents who claim to act as authorities on mathematics and end up being described as "teacher-centred" and "authoritarian," with the resultant tendency towards the apparent weak classification and framing of educational transmissions at the level of schooling. We can read the authors as arguing that pedagogies exhibiting strong classification and framing are essentially attempts at directly transmitting logic-mathematical thought but which, in the very attempt to do so, inevitably reproduce mathematics as "social" knowledge; that is, as transmissible signifiers rather than as the intended logico-mathematical signifieds which can only be "constructed" by the student. With respect to the acquisition of logico-mathematical knowledge, then, it follows that the student is conceived of as an autodidact.

In our terms, this simply means that the student necessarily takes on both transmission- and acquisition-functions. If this is the case, we would expect the structure of evaluative events to be such that *both* transmission- and acquisition-functions are routinely distributed to the student. We would also expect that evaluative events are such that the student is required to demonstrate the "construction" of mathematical necessity. The latter requirement implies that evaluative events routinely demand mathematical reflection of the student since reflection is a necessary prerequisite for the establishing of necessity. Therefore, when considering the results of our analytic descriptions of the *Mathematics at work* Tasks and Units, and also of the video records of instances of exemplary PCA teaching, we focus on three fundamental questions:

(1) To what extent is mathematical reflection demanded within evaluative events? If reflection is not demanded then in terms of Hegel's schema, the establishing of mathematical necessity is

suspended for the student.

(2) To what extent is mathematical necessity demanded? If the establishing of mathematical necessity is not demanded of the student then the pedagogy has to rely on an implicit acceptance of the establishing of necessity elsewhere, external to the student's engagement with the content.

(3) To what extent are both transmission- and acquisition-functions distributed to the student? If the student is effectively an autodidact then, in addition to the usual distribution of an acquisition-function to the student, a transmission-function must also be distributed to him/her.

In answering our questions we will discuss each question in relation to the *Mathematics at work* texts and then in relation to the tasks that students engage with in the video records.

8.2 The extent to which mathematical reflection is demanded

In order to answer the first two questions we should first assess the extent to which pedagogic judgement is required to refer to mathematics rather than only to the extra-mathematical.

8.2.1 The demand for mathematical reflection in the *Mathematics at work* texts

We start with an examination of the results of coding the movement of the notion in Tasks and Units of the *Mathematics at work* texts as summarised in Table 8.1. The problems presented in every Task and Unit in each of the Grades 1 to 4 textbooks was analysed.

It is clear from the summary that a very high proportion of the Tasks and Units (93.4% overall) require that pedagogic judgement ultimately refer to mathematical rather than extra-mathematical notions or objects. That is so despite the requirement that, in general, the missing representation extensively signifies the extra-mathematical (70.5% overall). Recall that the existence of a notion for Tasks and Units was indicated only when the notion or object to be acquired was *mathematical.*

The particular notion or object to which pedagogic judgement is meant to refer for any given Task or Unit is revealed most clearly in the teacher's guides which were used in order to confirm what the specific notion or object was. Hence the apparently curious result of extensive signification of the extra-mathematical in the textbooks combined with pedagogic judgement that references mathematical notions or objects most of the time. The requirement that the notion or object of pedagogic judgement be mathematical indicates that the ideal acquirer is one who, at the level of content (the signified), transforms the apparent weak classification with respect to mathematics of the Tasks and Units into strong classification.

A few more features of the summarised results should be noted. The signification of the extra-mathematical generated by the representation of the missing representation (RMR) and the missing representation (MR) remains fairly stable across all the Grades: an average decrease of only 3.8%

(with a standard deviation of 1.9%) in the signification of the extra-mathematical, moving from the RMR to the MR. In Dowling's (1998) terms, this result suggests that the dominant domain of practice of the Tasks and Units of the *Mathematics at work* texts is essentially the public domain since both expression (RMR) and content (MR) would have to be judged to exhibit weak classification with respect to mathematics.

			Movement of the judgement				
Grade	Missing Representation		Rep. of Missing Representation		Refl.	Nec.	Not.
	M	~M	M	~M			
Grade 1 (*N* = 80)	58	67	17	72	49	1	76
	72.5%	83.8%	21.3%	90.0%	61.3%	1.3%	95.0%
Grade 2 (*N* = 101)	62	91	28	95	26	1	89
	61.4%	90.1%	27.7%	94.1%	25.7%	1.0%	88.1%
Grade 3 (*N* = 160)	92	150	32	153	58	3	156
	57.5%	93.8%	20.0%	95.6%	36.3%	1.9%	97.5%
Grade 4 (*N* = 574)	273	337	271	355	132	6	534
	47.6%	58.7%	47.2%	61.8%	23.0%	1.0%	93.0%
Total (*N* = 915)	485	645	348	675	265	11	855
	53%	70.5%	38.0%	73.8%	29%	1.2%	93.4%

Table 8.1: Movement of the judgement in *Mathematics at work* texts

With respect to the signification of mathematics, we see a substantial change across Grades 1 to 3 when comparing the signification of the RMR against that of the MR: an average increase of 40.8% (standard deviation of 9.2%) as we move from the RMR to the MR. For the Grade 4 text the signification of mathematics remains very stable (RMR: 47.2% vs. MR: 47.6%): a slight increase of 0.4% in the signification of mathematics from the RMR to the MR.

What is initially surprising in the summary of Table 8.1 is the decline in the explicit signification of mathematics with respect to the MR as we move from Grade1 to Grade 4: from 72.5% (Grade1) to 61.4% (Grade 2) to 57.5% (Grade 3) to 47.6% (Grade 4). The dramatic decline in the signification of mathematics with respect to the MR can be explained by noting that while the ideal acquirer of the pedagogy is the one who transforms weak classification with respect to mathematics into strong classification, s/he must learn to do so. Initially the signification of mathematics has to be fairly visible (72.5% in Grade 1) so that the student can acquire an imperative element of the recognition and realisation rules, demanding that at the level of content (that is, of the signified), they should transform the extra-mathematical into mathematics. That means that the student should come to recognise the extra-mathematical as an instance of mathematics. The puzzle for the student is to decide what mathematics content to attach to the extra-mathematical and not whether or not s/he is being confronted with mathematics—s/he must participate in what Dowling (1998) refers to as the "myth of reference."

As the student progresses across the grades the signification of mathematics can become increasingly implicit because the student is presumed to have acquired the disposition and skill to read the extra-mathematical in mathematical terms. Of course, we can also see the decline in explicit signification of mathematics as a test of the student: have they acquired a crucial element of the recognition and realisation rules? Are they colluding in the myth of reference? Again in Dowling's terms, we might say that the pedagogy, while ostensibly producing public domain text, actually orients the student towards the descriptive domain. Such an orientation is entirely consistent with the presumed practices of the ideal acquirer of the pedagogy, who is required to read the extra-mathematical as an instance of mathematics.

Now an interesting feature of Dowling's descriptive domain is that it presupposes access to the esoteric domain of mathematics in the sense that a mathematical description of the extra-mathematical demands a knowledge of the appropriate mathematics of the agent generating the description. If it is the case that the student is increasingly oriented towards the descriptive domain, then s/he must simultaneously be placed under pressure to acquire the necessary mathematics to become so oriented. However, a significant problem with such a procedure in this instance is that it is a condition of the pedagogy that the "necessary mathematics" be selected by the acquirer. But the required "necessary mathematics" can be selected only from contents for which the acquirer has already established mathematical necessity (or, that have been marked as such); namely, that which s/he truly "understands." That is, mathematics which s/he has apparently reproduced without having being explicitly taught. Fortunately for the pedagogy and the pedagogue, but perhaps not so for the student, many of the problems confronting the student of elementary arithmetic can be solved by using counting strategies in place of more sophisticated arithmetic operations and procedures, so that the "necessary mathematics" can be mere counting for an extended period of time. For example, when asked to share a certain number of identical objects (say, x) amongst a given number of children (say, y), a student can solve the problem by marking out x 1s and arranging those into y groups of 1s, and can, in principle at least, continue to use such procedures for as long as s/he wishes rather than acquire more sophisticated techniques for performing division.

Let us now consider the extent to which reflective judgement is demanded by the evaluative events of the *Mathematics at work* series. Table 8.2 summarises the extent to which reflective judgement is demanded. Note that reflective judgement can, in principle, in a single evaluative event, be directed at the non-mathematical as well as mathematics, and especially so in the context of a pedagogic modality that recruits the non-mathematical everyday. Where reflective judgement is demanded, we see that very little of such judgement is actually focused on the non-mathematical (4.6% across Grades 1 to 4). This result indicates once again that, at the level of the signified, mathematics rather than the non-mathematical is prioritised. Overall, 26.2% of Tasks and Units demand reflective judgement that focuses on mathematics.

It is interesting that the demand for mathematically reflective judgement in the Tasks and Units shows a general decrease as we move across the grades from Grade1 (58.8%) to Grade 4 (19.2%) and, as the demand for mathematically reflective judgement decreases, there is an increase in the deployment of the paradigmatic form of evaluation—from 36.3% of Tasks and Units in Grade 1 to 71.1% in Grade 4. Within the paradigmatic form of evaluation reflection is minimised because necessity has, firstly, been established at a moment prior to the student's encounter with particular mathematical contents and, secondly, is guaranteed in the presence of the teacher and/or text. In other words, the student is not required to establish mathematical necessity but merely to accept that necessity has already been established elsewhere, hence minimising the demand for reflective judgement.

Grade	Paradigmatic evaluation	Reflective judgement	Mathematically reflective	~(Mathematically) reflective	Mathematical necessity
Grade 1 (*N* = 80)	29 36.3%	49 61.3%	47 58.8%	2 2.5%	1 1.3%
Grade 2 (*N* = 101)	64 63.4%	26 25.7%	25 24.8%	1 1.0%	1 1.0%
Grade 3 (*N* = 160)	96 60.0%	58 36.3%	58 36.3%	0 0.0%	3 1.9%
Grade 4 (*N* = 574)	408 71.1%	132 23.0%	110 19.2%	39 6.8%	6 1.0%
Total (*N* = 915)	597 65.3%	265 29.0%	240 26.2%	42 4.6%	11 1.2%

Table 8.2: Extent of demand for reflective judgement and the establishment of necessity in the Grades 1 to 4 *Mathematics at work* texts

8.2.2 The demand for mathematical reflection in the video records

Before discussing mathematical reflection and necessity with reference to the tasks engaged with in the video records we produce a brief analytic description of students' engagements with the tasks which can be found in Appendix 1. The results of the analysis are summarised in Tables 8.3, 8.4 and 8.6.

When we compare the extent to which mathematics and the non-mathematical are signified by the RMR and MR in the tasks of the video records with those of the *Mathematics at work* Tasks and Units we see a similar pattern. The signification of the non-mathematical remains relatively stable when compared with the signification of mathematics. In the movement from the RMR to the MR in the video records, the signification of the non-mathematical moves from 78.6% to 71.4% while the signification of mathematics moves from 21.4% to 92.9% (see Table 8.3); in the *Mathematics at work* texts the signification of the non-mathematical moves from 73.8% to 70.5% and that of the mathematical from 38% to 53% (see Table 8.1).

			Movement of the judgement				
Task	Missing Rep.		Rep. of Missing Rep.		Refl.	Nec.	Not.
	M	~M	M	~M			
1	0	1	0	1	1	0	1
2	1	1	0	1	0	0	1
3	1	1	0	1	0	0	1
4.1	1	1	0	1	0	0	1
4.2	1	1	0	1	0	0	1
4.3	1	1	0	1	0	0	1
4.4	1	1	0	1	0	0	1
4.5	1	1	0	1	0	0	1
5.1	1	0	0	1	0	0	1
5.2	1	0	1	0	0	0	1
5.3	1	0	1	0	0	0	1
6	1	1	0	1	0	0	1
7	1	1	0	1	0	0	1
8	1	0	1	0	1	0	1
Total	13	10	3	11	2	0	14
%	92.9%	71.4%	21.4%	78.6%	14.3%	0%	100%

Table 8.3: Movement of the judgement in tasks engaged with in the video records

Therefore, in both the *Mathematics at work* texts and the instances of exemplary pedagogic practice the more substantial movement in signification from the RMR to the MR happens with respect to the signification of mathematics rather than that of the non-mathematical. From this we can conclude that in exemplary PCA pedagogic practice, as with the *Mathematics at work* texts, an attempt is made to prioritise mathematics. As we saw when discussing the Tasks and Units of *Mathematics at work* texts, the notions the judgement refers to in the tasks engaged with in the video records are mathematical (see Table 8.3). However, only two of the fourteen tasks demand mathematically reflective judgement of the student (see Table 8.4), which is not surprising given that the dominant modality of evaluation is that of paradigmatic evaluation (see Tables 8.4 and 8.6 below).

We can now move on to a discussion of the demand for the establishing of mathematical necessity in the *Mathematics at work* texts and instances of exemplary PCA teaching.

8.3 The extent to which the production of mathematical necessity is demanded

If we now turn to the question of the extent to which the *Mathematics at work* Tasks and Units and the tasks that are engaged with in the video records demand that the student establish mathematical necessity we find that such demand is rather meagre. The summary shown in Table 8.2 reveals that, overall, only 1.2% of Tasks and Units of the *Mathematics at work* texts demand that the student establish mathematical necessity. Similarly, according to the results of our analysis of the video records, the establishing of mathematical necessity is not demanded in the reviewed instances of exemplary PCA teaching and learning (see Table 8.4). It follows that mathematical necessity must be taken as always-already established, even if only implicitly. At first blush it would appear that the guarantor of mathematical necessity is therefore the text and/or the teacher, which would lead us back to what the proponents of the PCA refer to as "traditional teaching." What, then, can we conclude from the result that while the judgement of reflection is demanded to some extent, the judgement of necessity is effectively suspended?

Task	Paradigmatic evaluation	Reflective judgement	Mathematically reflective	~(Mathematically) reflective	Mathematical necessity
1	1	1	1	0	0
2	1	0	0	0	0
3	1	0	0	0	0
4.1	1	1	0	0	0
4.2	1	0	0	0	0
4.3	1	0	0	0	0
4.4	1	0	0	0	0
4.5	1	0	0	0	0
5.1	1	0	0	0	0
5.2	1	0	0	0	0
5.3	1	0	0	0	0
6	1	0	0	1	0
7	1	0	0	0	0
8	0	1	1	0	0
Total	13	3	2	1	0
%	92.9%	21.4%	14.3%	7.1%	0%

Table 8.4: Extent of demand for reflective judgement and the establishment of necessity in the tasks engaged with in the video records

In our attempt at answering the question we should not forget that reference to the everyday is an overwhelming signifying presence in the *Mathematics at work* texts (see Table 8.1). It would seem that the significance of the presence of the everyday resides in the exploitation of its evocation of the apparently unmediated truth of self-experience at the levels of both the RMR and MR: our commonplace activity within a "life-world" is such that rigorous questioning of the validity of everyday experience is inappropriate because it would have the effect of rendering the simplest of tasks impossible to perform. In other words, we are obliged to implicitly accept the hypothesis of the existence of a "big Other" who grounds our actions by guaranteeing the consistency of our "life-world." The alternative to the (mis)recognition and acceptance of such consistency is, in psychoanalytic terms, psychosis—the psychotic being the subject who holds to beliefs and attitudes excluded by our "life-world," in effect refusing the symbolic pact which asserts that existence is, ultimately, always-already meaningful. The late Wittgenstein may be of some help at this point.

Wittgenstein (1969) contrasts "objective" with "subjective certainty," the latter being certainty arrived at from the subjection of experience to doubt, of testing the accuracy of claims to knowledge. "Objective certainty"—Wittgenstein's version of the "big Other"—is the name for the presumed consistent background which makes possible "subjective certainty" and which, were it to be called into question, would result in the experience of a loss of reality, of the "life-world" as inconsistent (cf. Žižek, 2002: 141-75). Now formal education, concerned as it is with questions of doubt, accuracy, falsity, truth, validity, reliability, knowledge and ignorance, even if only in a minimal way, demands of pedagogic subjects an orientation to meaning that privileges "subjective certainty." The incorporation of the everyday into the academic within the PCA, however, potentially encourages an orientation to meaning which privileges "objective certainty," but with a twist: to the extent that the recruitment of the everyday in the reproduction of school mathematics produces a "myth of reference" (Dowling, 1998) mathematics is situated precisely within "objective certainty," forming part of that which guarantees the consistency of the "life-world" (two examples: (1) the popular science platitudes presenting mathematics as the "language of the universe" and (2) the existence of so-called "ethnomathematics" at work in diverse social practices). If mathematics resides within "objective certainty," then, on the one hand, the PCA demand for the operation of the judgement of reflection, taken together with the suspension of the judgement of necessity is apparently concerned with revealing the mathematical features of that consistency rather than establishing it. But, on the other hand, if reflection is not required to establish mathematical necessity—since mathematics is always-already positioned as an element of "objective certainty"—does the judgement of reflection have an additional purpose here? The only answer can be that the judgement of reflection within the PCA is primarily concerned with revealing the nature of the subject of the enunciation (the position from which the student speaks) rather than establishing the necessity of the subject of the enunciated (mathematics; the everyday).

Note now how the split between the signifier and signified with respect to mathematics content is redoubled at the level of the pedagogic subject tasked with "constructing" mathematical signifieds: just as the pedagogic constructivist is haunted by uncertainty about the relation between the signifier and signified at the level of content, so is s/he too at the level of the relationship between the subjects of the enunciated and of the enunciation. The solution can, unfortunately for the pedagogic constructivist, be sought only at the level of the materiality of the subject of the enunciated, from which it follows that *signifying form* must be taken as indicating the natures of both the signified and the subject of the enunciation. However, it is the latter, the subject of the enunciation, which testifies as to the veracity of signifying form (and hence, of the signified).

In Wittgenstein's terms it would appear that the object of the work of arriving at "subjective certainty" in the PCA is not that of establishing the necessity of either mathematics or the everyday but rather the necessity of the PCA pedagogic subject. In other words, that which is to be "constructed" is not a series of epistemological objects (mathematics) because such construction requires an arrival at necessity, but rather a specific moral subject (the pleasured student, amenable to utilitarian moral regulation). In the terms of the argument elaborated by Moore & Muller (1999), we might say that the PCA reduces epistemology to morality, in that way rendering itself a species of "voice discourse." Moore & Muller dismiss the "voice discourse" as essentially a position-taking strategy that undermines not only the (re)production of erudite knowledge when it is taken seriously, but also, for that very reason, itself! Their initial description of this "discourse" aligns it with

> approaches that question epistemological claims about the objectivity of knowledge (and the status of science, reason and rationality, more generally) [and which] adopt, or at least favour or imply, a form of perspectivism which sees knowledge and truth claims as being relative to a culture, form of life or standpoint and, therefore, ultimately representing a particular perspective and social interest rather than independent, universalistic criteria. They complete this reduction by translating knowledge claims into statements about knowers. Knowledge is translated into knowing and priority is given to experience as specialised by category membership and identity. [...] Today, the most common form of this approach is that which, drawing on postmodernist and poststructuralist perspectives, adopts a discursive concern with the explication of 'voice' (Moore & Muller, 1999: 189-90).

Moore & Muller state that the episodic recurrence of "voice discourse" and its apparent resilience, despite the death of its *bête noire*—"a simplistic and positivistic caricature of science" (ibid.:189)—as well as continued criticism against it, demands explanation, and suggest explaining "voice discourse" by way of a description of the structuring of the intellectual field. What they end up doing, using Bernstein, is producing a structural description of "voice discourse" that demonstrates its inadequacy with respect to the production and reproduction of vertical discourse. The description they generate constitutes, at one and the same time, the diagnosis and treatment of the intellectual malady they term "voice discourse"—not unlike Freud's approach to hysterical symptoms in which diagnosis and treatment constitute a single path. Unfortunately, unlike hysterical symptoms which, initially at least for Freud, dissolved as a consequence of their psychoanalytic description, "voice discourses" prove to be much more resilient.

8.4 The distribution of transmission- and acquisition-functions

As we saw in earlier Chapters, the proponents of the PCA regard attempts at the explicit transmission of mathematical knowledge with suspicion and conceive of the student of mathematics as an autodidact. In our terms, this means that the PCA student must be one who takes on both transmission- and acquisition-functions, following on from which it should be the case that the predominant realisation of the acquisition-function should be of the form student-as-other while that of the transmission-function should be of the form student-as-transmitter. In addition instances of the exclusive realisation of the paradigmatic form of evaluation, in which we have the transmission-function taking on the form transmitter-as-transmitter, and the acquisition-function that of student-as-student, should be minimal.

When we examine the Tasks and Units of the *Mathematics at work* texts we find that, with respect to the distribution of subject-positions, transmitter-as-transmitter (93.7% overall) and acquirer-as-acquirer (98% overall) are the most commonly realised, indicating that the paradigmatic form of evaluation is the overwhelmingly dominant mode of evaluation. The subject-positions acquirer-as-transmitter and acquirer-as-other are realised in only 7.1% and 3.7%, respectively, of Tasks and Units overall (see Table 8.5).

	Subject-positions					
Grade	transmission-function			acquisition-function		
	T	S	O	S-S	S-O	O
Grade 1 (*N* = 80)	79 98.8%	1 1.3%	0 0.0%	80 100.0%	1 1.3%	0 0.0%
Grade 2 (*N* = 101)	101 100.0%	1 1.0%	0 0.0%	101 100.0%	1 1.0%	0 0.0%
Grade 3 (*N* = 160)	158 98.8%	11 6.9%	0 0.0%	158 98.8%	10 6.3%	1 0.6%
Grade 4 (*N* = 574)	519 90.4%	52 9.1%	31 5.4%	558 97.2%	22 3.8%	31 5.4%
Total (*N* = 915)	857 93.7%	65 7.1%	31 5.4%	897 98%	34 3.7%	32 3.5%

Table 8.5: Summary of the distribution of transmission- and acquisition-functions in the *Mathematics at work* texts

There is, however, a small but steady increase in the distribution of the transmission-function to students from Grade 1 to Grade 4: 1.3%, 1%, 6.9% and 9.1%, respectively (see Table 8.5). Corresponding to the distribution of the transmission-function to students we see a similar increase in the occurrence of the acquisition-function modalities acquirer-as-other and other. If we take the acquirer-as-other and other modalities in Table 8.5 together we see that the distribution from Grade 1 to Grade 4 is: 1.3%, 1%, 6.9% (11 of 160 tasks) and 9.2% (53 of 574 units), respectively.

An examination of the video records reveals that, as with the *Mathematics at work* texts, the paradigmatic form of evaluation is once again the primary evaluation modality. In the terms of our analysis, only one of the fourteen tasks engaged with by students in the video records of exemplary PCA teaching and learning, Task 8, exhibits an evaluative structure that can be aligned with the declared principles of the PCA (see Table 8.6). The evaluative structure of Task 8, which is shared by 0.6% of Grade 3 *Mathematics at work* tasks and 5.4% of Grade 4 Units, is of a form that requires more competent students to teach their peers. We argued in an earlier Chapter that, even though it is accepted within PCA theory, such an evaluative structure appears to contradict the central pedagogic constructivist proposition on the impossibility of teaching: it is impossible to transmit knowledge, hence (expository) teaching should be prohibited; nevertheless, it *is* possible for children to teach each other. In other words, the transmission and acquisition of knowledge are simultaneously both possible and impossible. The way in which the PCA proponents mask the problem is to distribute the impossibility and possibility of teaching to the teacher and student, respectively. This crack in the theoretical edifice of the PCA is precisely an effect of the shift from epistemology to morality that characterises "voice discourses" and it has the structure of fetishistic disavowal: I know that teaching is impossible, yet I nevertheless believe that it is possible.

	Subject-positions					
Task	transmission-function			acquisition-function		
	T	S	O	S-S	S-O	O
1	1	0	0	1	0	0
2	1	0	0	1	0	0
3	1	0	0	1	0	0
4.1	1	0	0	1	0	0
4.2	1	0	0	1	0	0
4.3	1	0	0	1	0	0
4.4	1	0	0	1	0	0
4.5	1	0	0	1	0	0
5.1	1	0	0	1	0	0
5.2	1	0	0	1	0	0
5.3	1	0	0	1	0	0
6	1	0	0	1	0	0
7	1	0	0	1	0	0
8	0	1	0	1	0	1
Total	13	1	0	14	0	1
%	92.9%	7.1%	0%	100%	0%	7.1%

Table 8.6: Summary of the distribution of transmission- and acquisition-functions in the video records

8.5 The precipitation of the principle of utility

The results showing that the paradigmatic evaluative form is dominant are hardly surprising in the light of the results discussed in Sections 8.1 and 8.2: since the demand for the establishing of mathematical necessity is effectively suspended in both the *Mathematics at work* texts as well as in the video recorded instances of exemplary PCA teaching, the dominant mode of evaluation would have to be that of the paradigmatic form if school mathematics is to be reproduced.

In Table 8.7 we list the "contexts" used in each of the tasks that are engaged with by students in the video record. Not unexpectedly we find that 9 of the 14 tasks (as numbered by us)[19] reference recreational activities (64.3%), signifying the circulation of pleasure once again. Recall that the video records were produced for the purposes of the production of a television series broadcasted on public television in South Africa, so that the signification of pleasure as an integral feature of the PCA should be taken as scripted. As with the *Mathematics at work* texts, the signification of pleasure is associated with the extra-mathematical everyday, the latter being an index of the circulation of so-called "relevance" in the approach to mathematics privileged by the PCA; in fact, 11 of the 14 tasks (78.6%) listed in Table 8.7 reference the extra-mathematical.[20] Here we witness the precipitation of utilitarian moral regulation from the tasks students engage with yet again.

Task	Contextualising activity
1	Picking flowers (for a dinner party).
2	Attending a rock concert.
3	Bus transportation.
4.1	Playing with marbles.
4.2	Playing with marbles.
4.3	Playing with marbles.
4.4	Playing with marbles.
4.5	Playing with marbles.
5.1	Date: the 13th; counting out 13 plastic blocks.
5.2	Finding 13 on a 100-square.
5.3	Describing the number 13.
6	Buying ice-cream.
7	Buying ice-cream.
8	Multiplication.

Table 8.7: Contextualising activities for the tasks in the video records

8.6 Summary

In this Chapter we focused on answering three related questions: (1) To what extent is mathematical reflection demanded within evaluative events? (2) To what extent is mathematical necessity demanded? (3) To what extent are both transmission- and acquisition-functions distributed to the student?

[19] If we count differently, say by grouping the series of tasks 4.1 to 4.5 and 5.1 to 5.3 and counting each series as 1, we find that 5 of 8 tasks (62.5%) signify the circulation of pleasure.

[20] If, as before, we count each series of tasks as 1 we find that 7 of 8 tasks (87.5%) reference the extra-mathematical.

As we examined the demand for mathematical reflection across the grades we found a steady decrease in such demand accompanied by an increase in what we have termed paradigmatic evaluation. Our examination of the demand for the establishing of mathematical necessity revealed that such demand is negligible and that the claims made for the "construction" of mathematics contents by the pedagogic subject are, therefore, questionable. As concerns the distribution of transmission- and acquisition functions to the pedagogic subject we found that the distribution, once again, conformed to the distribution we would expect to find within a pedagogy that employed chiefly the paradigmatic form of evaluation, where the transmission-function is distributed to the teacher, the acquisition-function to the student.

Chapter 9

Conclusion

9.1 Introduction

In this Chapter we start by presenting an overview of the thesis including summaries of the chief findings of our analysis of the *Mathematics at work* texts and also of our analysis of exemplary instances of problem-centred approach pedagogy. In Section 9.2 we will discuss the pedagogic device. In Section 9.3 we conclude the thesis with a discussion of research that extends the work of the thesis.

9.1.1 The origin of the research problem

I was invited by the originators of the problem-centred approach to visit a school in which they were working with primary school teachers and their students on developing a pedagogic modality derived from a constructivist epistemology. The school was typical of the primary schools found in lower working class suburbs of Cape Town serving so-called "coloured" communities. I observed a teacher working with Grade 2 students who displayed a facility in working with fractions that was way beyond the level I expected. The students were not only able to perform complex calculations, but were also able to explain their reasoning. I was intrigued. I was witnessing students doing mathematics that, according to the theory, they should not be able to do. First, the problems displayed extensive references to the everyday, which meant that the students would have to be able to recognise the mathematical descriptions of the everyday used to construct the problems. Second, the students were from lower working class homes and were using language and reasoning in a way that displayed none of the features of what Bernstein once referred to as a "restricted orientation to meaning." Third, I had previously visited primary schools on the invitation of a different mathematics education development initiative, who were presenting mathematics in an apparently similar fashion, but who were producing disastrous results: happy, warm classrooms populated by teachers and students who produced statements and cipherings that could not be recognised as mathematics. The latter situation appeared to be fairly common, nationally.

What was happening with the problem-centred approach to mathematics teaching that brought its originators success under conditions that usually produced failure for others? A closer look at their work revealed that the originators were involved in research projects directly related to their work on the development of their pedagogic modality, off which they produced teacher training programmes and school mathematics texts. They also published widely in research and professional journals and presented their work at the major mathematics education conferences. Their work appeared to be developed in a fairly principled fashion and they defended their pedagogic position by referring to research results. Given the generally coherent nature of their endeavour, and their success where theory suggested that they should fail, it seemed that they would serve as an excellent case for a research study, and not only because they were a curiosity. Their work presented a challenge in the sense that theory could not adequately grasp what they were doing.

9.1.2 A brief comment on the engagement with Bernsteinian theory

Bernstein describes the pedagogic device as the structure that does the work of transforming knowledge into pedagogic communication. So, since our interest in the workings of problem-centred approach could be described as an investigation of the structuring of pedagogic communication produced by the "approach," it seemed obvious that the research problem should be defined in the terms of the pedagogic device and its internal relations.

The first port of call was, of course, a specification of pedagogic discourse as realised by the problem-centred approach. However, it quickly became apparent that the specific pedagogic discourse remained somewhat mysterious without considering the distributive rule and its structuring effects on pedagogic discourse.

However, once the general features of the distributive rule were revealed, and we could get some sense of why the recontextualising rule worked as it did for the problem-centred approach, that still did not allow us to grasp adequately either the transformation of knowledge into pedagogic communication or how mathematics contents were being reproduced. We could explain significant features of the moral discourse, but not really much of the instructional, for the internal regulation of mathematics is distinct from the particular structuring of the social. The regulative discourse allows us to explain why certain mathematics content selections are made and how they are presented, but remains inchoate on how they come to be reproduced.

It therefore appeared that a more adequate answer to the question would be revealed at the level of the evaluative rule. However, once we approach the evaluative rule we come up against a static structure that fails to grasp the necessary temporality of pedagogic action. Interestingly, on investigation we find that temporality obtains at both the levels of the instructional and regulative discourses. The pedagogic modality could, of course, have been described in terms of the values of classification and framing but, again, such a description would not have enabled us to engage adequately with the temporality in either instances of either actual classroom activity or in texts.

We discuss the pedagogic device in grater detail below.

9.2 An overview of the thesis

The thesis started with a conundrum set firmly within Bernsteinian sociology of education: on the one hand we have a corollary, derived from the proposition that the everyday and the academic are incommensurable, stating that the incorporation of the everyday into the academic produces a hybrid discursive form which is neither academic knowledge nor everyday knowledge, and so is not of much utility in either of those fields; on the other hand, we witness an increasing incorporation of the everyday in the academic, even by agents in the pedagogic recontextualising field who are well aware of the Bernsteinian argument spelling out the problems of such a strategy. Beyond the activity of agents in the pedagogic recontextualising field, however, the idea that the incorporation of the everyday into the academic is pervasive functions as a "spontaneous philosophy." Yet, when we ask proponents to explain the educational value of the strategy (e.g., student teachers, in-service teachers, school students), they inevitably refer to the need of students to experience learning as fun. A closer examination of published curriculum texts for school mathematics revealed that the incorporation of the everyday is accompanied by an insertion of the signification of pleasure into school mathematics pedagogic texts. These revelations open up a different understanding of the call for "relevant education."

The rhetoric flowing from the pedagogic recontextualising field about knowledge needing to be immediately relevant to the imperatives of the field of economic production (the world of work) and the individual needs of citizens, is understood here as the ideological expression in schooling of a more general political and economic demand for the dissolution of boundaries. We argued that contemporary utilitarianism generates the coordinates for an apposite form of moral regulation in service to an essentially economic imperative which is translated into the necessary reconfigurations of the contents of the distributive, recontextualising and evaluative rules of the pedagogic device at the level of the reproduction of knowledge. This means that education policy, curriculum, and pedagogic practice are all subjected to a series of transformations that aligns the education system with the economic imperatives issuing from capital.

In this study we have shown in detail how reference to pleasure is recruited in the newly transformed South African education system in a single case. It was necessary to study a case in detail in order to generate insights into how pleasure is being made to function in schooling and also to indicate how we might rethink the structuring of pedagogic discourse and the pedagogic relation in Bernsteinian terms to take account of pleasure.

A study of the early Bernstein revealed that the problematic of pleasure was effectively excised from the theory as Bernstein moved away from the work of Talcott Parsons. The more obscure link to the problematic of pleasure that remained in Bernstein after Parsons' categories were transformed to construct the notion of pedagogic discourse was through the notion of classification, as suggested by Bernstein himself (Bernstein, 1994). More generally, however, pleasure is merely the particular historically-specific resource recruited by pedagogic discourse to effect a shift from imaginary to symbolic identification that is necessary for the reproduction of specialised knowledge.

The structure of the pedagogic device, with its series of dialectically enchained rules, indicated that we would need to approach the problem at both the empirical and theoretical levels through a study of the functioning of the evaluative rule of the device. That investigation has enabled us to reconsider the structuring of pedagogic discourse and to redescribe the latter in terms that allow the problematic of pleasure to be inscribed into the theory, but in a more general form as will be shown below.

At the concluding section to Chapter 4 we produced a series of propositions consisting of thirteen theoretical propositions, three empirico-theoretical propositions and three research propositions. The theoretical propositions were the main results derived from our engagement with antecedent theoretical work of importance for our investigation and were expressed as propositions on pedagogic judgement. The theoretical propositions were deductively generated from previously established results and their validity depends on the validity of their status as deductions.

The empirico-theoretical propositions were concerned with establishing the general features of the content of the pedagogic device at this particular juncture, the validity of which are to be judged on their reasonableness as theoretically informed descriptions of the general historically-specific context structuring schooling.

The final set of propositions were the research hypotheses that collectively constitute the research question.

9.3 The pedagogic device

At one level this project has been an investigation of the workings of the structure Bernstein refers to as the pedagogic device. For Bernstein the device is that set of relations which transforms knowledge into pedagogic communication. We approached the pedagogic device as a formal structure, the content of which has to be historically specified. To that end, Chapters 2, 3 and 4 focused on establishing the broad features of that which is internal to the distributive, recontextualising and evaluative rules at this time.

9.3.1 The distributive rule

The content of the distributive rule defines the dominant principle of classification, taking its direction from the division of labour and relations within the division of labour as structured under conditions of late capitalism. By drawing on Marx and Sohn-Rethel we argued that the form taken by the circulation of capital through commodity-exchange, through real abstraction, produces the form of what Sohn-Rethel refers to as theoretical thought without itself being that thought. More speculatively, we attempted to demonstrate through an analysis of contemporary advertisements that within the division of labour of symbolic control, of which schooling is a moment, that late capitalism produces a general call for the dissolution of boundaries. That call produces as an effect the contours of the principle of classification which is translated into appropriate forms at the different levels of the division of labour of symbolic control.

Within the context of the pedagogic device the call for the dissolution of boundaries produces the structuring of the contents of each of the rules of the device. The pedagogic subject demanded by the contemporary content of the distributive rule is one who experiences the external imposition of boundaries as a source of displeasure. Such a pedagogic subject does not, however, spontaneously arise, but has to be constituted through processes of symbolic control, specifically through subjection to moral regulation. An examination of the features of the moral order sponsored by official pedagogic discourse revealed that it could be described as a contemporary realisation of utilitarianism in which the instrumental value of knowledge is made coincident with the pleasure of the individual subject. In other words, the force of the content of the distributive rule is focussed primarily on the regulative regime of pedagogic discourse. With that we have drifted into the content of the recontextualising rule of the pedagogic device.

9.3.2 The recontextualising rule

The content of the recontextualising rule is a principle that translates the call for the dissolution of boundaries as the restructuring of relations between knowledge and between people in a manner that weakens the boundaries between fields of specialised knowledge and also between specialised and everyday knowledges, as well as flattens hierarchical pedagogic relations. Here the features of competence pedagogies as described Bernstein give the general form to the curriculum and also to the prescriptions for pedagogic practice as defined in official pedagogic discourse.

In the previous sub-section we argued that the distributive rule is primarily focussed on the regulative in pedagogic discourse. This is because regulative discourse, as the rules of social order, is the general mechanism for the normalising of the distribution of social goods, including the distribution of forms of knowledge and consciousness. However, the actual realisation of distribution—that is, of the regulation of consciousness as an effect of selection, pacing and sequencing of content—is ultimately the work of the evaluative rule at the level of the instructional discourse. In other words, what we have in the Bernsteinian distinction between the instructional and regulative discourses is a split internal to pedagogic discourse correlative to the split between the subject of the enunciated and the subject of the enunciation. The elementary operation of pedagogic judgement is the generation of a split between the subject of the enunciated content at the level of the instructional discourse and the subject of the enunciation. The latter, which is the subject presumed to be possessed of *jouissance*, is the primary target of the regulative *qua* moral discourse of pedagogic discourse with the purpose of instructing the pedagogic subject in how to enjoy in accord with the moral order. The split between the subjects of the enunciated and the enunciation is augmented in the form of a split internal to the subject of the enunciation, between the pedagogic subject as ideal ego and as ego-ideal.

A simplified diagrammatic representation of the general argument on the elementary operation of pedagogic judgement, without reference to the specific historical conditions, is shown in Figure 9.1. The structure which has been outlined diagrammatically in Figure 9.1 must be understood as making a general point about all pedagogic modalities and not only about the specific modality that is subjected to analysis in this work, or even only about competence pedagogies in general.

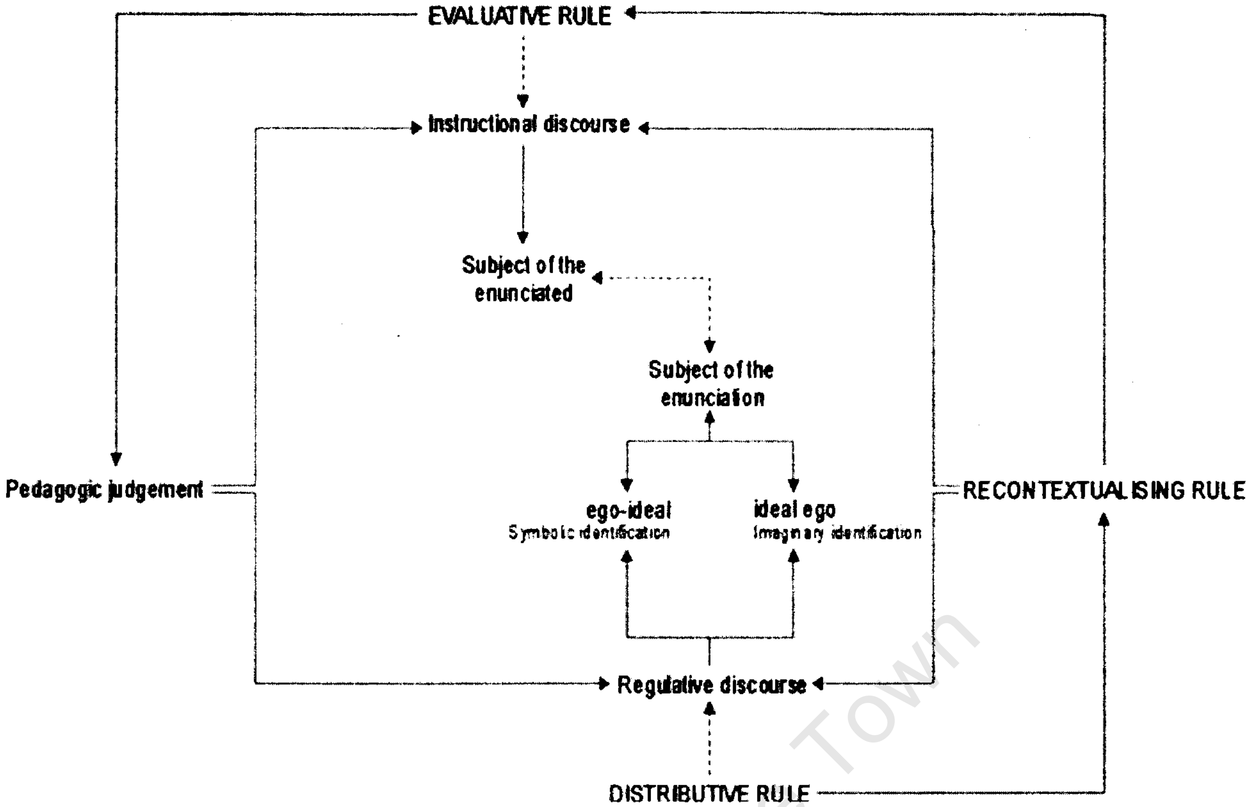


Figure 9.1: Situating pedagogic judgement within the pedagogic device

The dotted line linking the subjects of the enunciated and enunciation in Figure 9.1 is intended to indicate that the nature of the latter is hypothesised on the basis of an evaluation of the former. The dotted line linking the distributive rule to the regulative discourse is to be read as indicating that the content of the distributive rule structures the regulative; and the dotted line from the evaluative rule to the instructional discourse, as indicating that the evaluative rule structures the instructional. The specificities of the particular knowledge contents to be reproduced (instructional) as well as the distributive imperative issuing from the distributive rule (regulative) structure pedagogic judgement.

Recall, yet again, that Bernstein insists that the whole of the pedagogic device is condensed in the evaluative rule. This must mean, amongst other things, that the dominance of the regulative discourse must also be condensed in the evaluative rule. However, what does the proposition proclaiming the dominance of the regulative really mean at the level of the evaluative rule (specialisation of time, text and space)? Evaluation is regulative, so it follows that no specialisation will occur without regulation. But Bernstein's regulative discourse is aiming at something more specific than the general regulative effects of evaluation because the regulative is his name for moral discourse. On the one hand, the "object" that calls into action specific regulative discourse *qua* moral discourse is the subject of the enunciation because the latter is a point of indeterminacy, and hence a point of a potential alternative moral regulation as well as a point of potential resistance to the reproduction of knowledge. On the other hand, any attempt at the (re)production of knowledge cannot do without asserting, if only at a local level, a degree of normativity, and hence establishes rules of social order. All that this says is that the regulative is inescapably present in pedagogy. The regulative discourse is, therefore, necessary in the formal sense that there is no instructional discourse without a regulative discourse. A question now arises. Does the formal necessity of the regulative discourse equate to a proposition claiming its dominance? If "dominance" means "necessary," then the propositions are formally identical. If "dominance" is taken to mean that knowledge can be reproduced from only a particular moral base, then the propositions are very different and, in fact, the proposition proclaiming the dominance of the regulative would simply be false.

Bernstein's proposition claiming the dominance of the regulative is perhaps making a different point. If his proposition is primarily aimed at emphasising the bias written into the content of the distributive rule and, flowing from that bias, the social, political and economic consequences of the differential distribution of specialised consciousness for different categories of social agents, then the regulative discourse is indeed dominant, but in a very general sense pertaining to the reproduction of the division of labour. However, that does not tell us much about the how the instructional and regulative work in tandem to produce the specialisations of consciousness. For that we need to consider the workings of the evaluative rule and pedagogic judgement.

9.3.3 The evaluative rule

When we considered the functioning of the evaluative rule we found that Bernstein's account remains at a high level of generality that fails to enable a grasping of either pedagogic texts or pedagogic activity. The problem appears to be the absence of terms enabling a registration of the necessary temporality of the instructional and regulative dimensions of pedagogy. In Hegel's theory of judgement we find the resources for describing the temporality of pedagogy as well the point at which the regulative hooks on to the instructional.

In Lacanian terms we can argue that the content of distributive rule defines the coordinates of desire, which is just another way of saying that the distribution of social goods is normalised by the moral order. In other words, socio-economic conditions produce a particular desiring subject. The reproduction of specialised knowledge is forced to account of that subject but, at the same time, it must also take account of the internal specificities of the fields of knowledge that are to be produced. Bernstein's discussion of the differences between horizontal and vertical discourses and within vertical discourse, of horizontal and hierarchical knowledge structures, goes some way towards pointing out that pedagogic judgement must always take account of the specificities of the legitimating grounds of specialised knowledge.

What Hegel allows us to see is that the specialisation of consciousness requires that necessity—in Bernstein's terms, legitimacy—of knowledge contents (the instructional) has to be established in one or other way and that necessity is established over time. That "time" is both the temporal flow of pedagogic punctuation of the instructional discourse as well as, paradoxically, a "logical temporality":

immediacy-reflection-necessity. The establishing of necessity does, however, always come up against a point of indeterminacy which is the contingent activity of the pedagogic subject as subject of the enunciation. At the level of the pedagogic subject in its guise as subject of the enunciation, the regulative discourse translates the imperative flowing from the distributive rule into a "deontological" temporal series consisting of desire-ought-is in an attempt to align the place from which enunciations are made as internal to the moral discourse. However, the *jouissance* of the pedagogic subject is not eradicated and still persists as a point of indeterminacy. The argument is summarised diagrammatically in Figure 6.4 of Chapter 6, which we repeat here in modified form, as Figure 9.2.

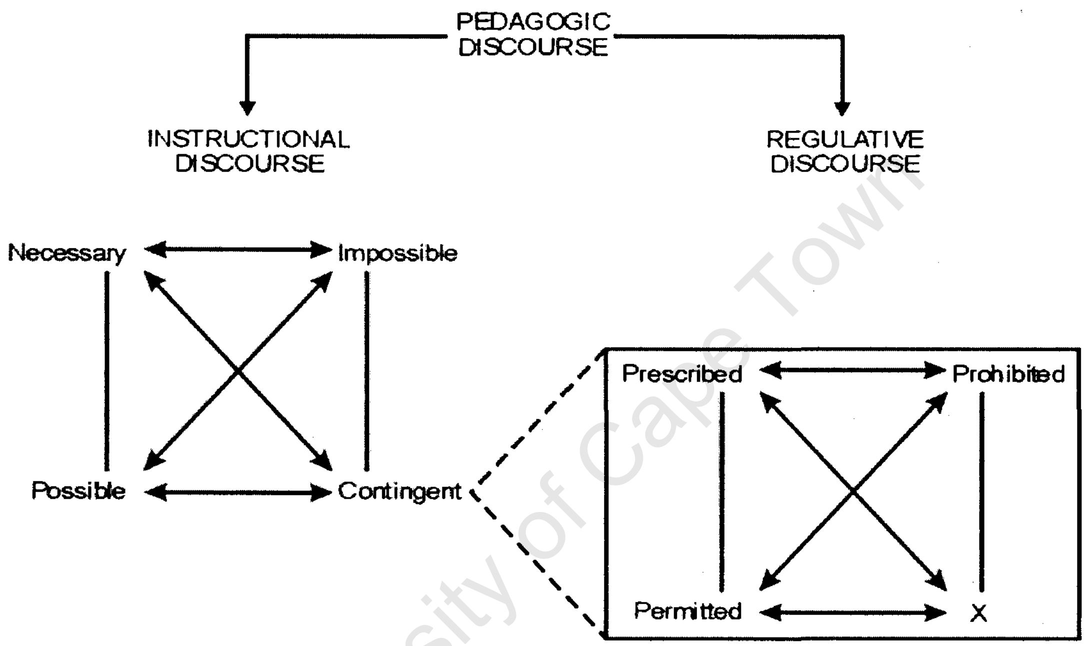


Figure 9.2: The relation between the instructional and regulative discourses in Hegelian terms

Note that while the problem-centred approach is a quasi-inductive pedagogic modality relying quite deliberately on the contingency of student activity, Hegel's point on the relation between the universal and the contingent is general: it is always the case that the universal can only assert itself in the contingent.

9.3.4 Summary

What we find is that the distributive rule supplies the general principle of classification, as described above. The recontextualising rule is, ultimately, the principle of framing over the regulative discourse, in accordance with the principle of classification derived from the distributive rule. The evaluative rule is the principle of framing over the instructional discourse, deriving its coordinates from the fields of knowledge to be reproduced, but in accordance with the principle of classification derived from the distributive rule, through the recontextualising rule. The latter qualification indicates that the regulative discourse attaches to the instructional in a manner that translates the principle of classification into a moralising of the pedagogic subject as subject of the enunciation. From this we can conclude that the regulative discourse is necessary, but not dominant with respect to the instructional discourse. When the regulative is actually treated as dominant, it appears to effect a disruption of the integrity of specialised knowledge at the level of the instructional discourse because the legitimating ground for the reproduction of specialised knowledge is thereby obliterated.

9.4 A discussion of the research hypotheses specific to the PCA

In what follows we draw together the results from the series of analyses of the problem-centred approach produced across the various Chapters of this work by revisiting the research hypotheses enumerated in Chapter 4. In each sub-section we first restate the pertinent hypothesis and then consider it in light of our investigation.

9.4.1 Research hypothesis 1

Regulative discourse drives the pedagogic subject towards pedagogic judgement through the imaginary-symbolic dialectic by employing pedagogic strategies that attempt to shift the identification of the pedagogic subject with the Imaginary to an identification with the Symbolic.

In Chapter 6 we found the that the *Mathematics at work* texts constitute an Imaginary order through the construction of a diegetic space that ostensibly mirrors the extra-mathematical life of the student, shown as saturated by useful (work) and pleasurable (recreational) activity. A similar strategy was found to be at work in the instances of actual pedagogic practice analysed in the form of the embedding of the mathematics contents in the extra-mathematical, discussed in Chapter 7.

We also found that the Imaginary as constituted in the texts and in pedagogic practice is already a distortion of the extra-mathematical life of the student in the direction of the Symbolic. The way in which such distortion was achieved was: (1) by presenting images of the everyday activity of the student as always-already governed by mathematical rationality; (2) by constructing metaphorical relations between mathematics contents and everyday activity and then negating the everyday pole of such metaphors; (3) by subjecting the unitary image of the body of the student to mathematical description, so disrupting that imaginary unity; and (4) by means of the deployment of the signification of different modalities of pleasure: *fun* (pleasure aligned with the Imaginary), *ideal fun* (pleasure aligned with the Symbolic), and *pixilation* (a disruption of significations of *fun*) which functions as a mediator between *fun* and *ideal fun*. The mechanism described under (4) appeared only in the analysis of the *Mathematics at work* texts and not in instances of pedagogic practice.

When we examined sequences of Tasks it became apparent that as pedagogic judgement acted on elaboration of mathematics content the regulative discourse exhibited its own temporality, which we described as a movement from *desire* to *ought* to *is*. This movement starts, as indicated, from the signification of a desiring subjective state attached to one or more textual characters with whom the student is expected to identify at the moment of existence/immediacy. Next, the moment of reflection/possibility introduces a moralising *ought* into the diegetic space of the text which is then followed by the moment of (apparent) necessity to establish an *is*. The target of the regulative trajectory is the student as subject of the enunciation. The initial imaginary identification with the textual characters is transmuted, through the insertion of an *ought* and the establishment of an *is*, into symbolic identification at the level of the regulative discourse. The trajectory of the regulative can now be seen to map directly onto the general quasi-inductive matrix employed in the elaboration of mathematics content by the pedagogy: the singular activity of the student mediates between the particular in the guise of the imaginary everyday and the symbolic universal. The singular activity of the student is the locus of the contingent, which is why the place from which the student produces statements (subject of the enunciation) becomes the target of regulative discourse as it simultaneously structures the elaboration of the instructional content (the enunciated).

9.4.2 Research hypothesis 2

The pedagogic subject's enunciations of pleasure issue from an injunction to enjoy emanating from regulative discourse.

The injunction to enjoy in a particular way is announced in different ways. First, as we saw in Chapter 6, through the simple device of the presentation of the diegetic space of the text as a universe of student pleasure and various forms of labour, the world constructed for imaginary identification implicitly announces that the coincidence of pleasure and utility are to be taken as the normal state of social existence. In Chapter 7 our analysis of the video records of exemplary PCA pedagogic practice and the series of interviews with students revealed that the originators of the PCA explicitly demand that students (and their teacher) announce their experiences of learning (and teaching) as pleasurable.

9.4.3 Research hypothesis 3

The image of the student as an autodidact is a necessary fiction, the purpose of which is to mask the inevitable alienation that inheres in the acquisition of specialised knowledge.

In Chapter 8 we asked three related questions that address the hypothesis: (1) To what extent is mathematical reflection demanded within evaluative events? (2) To what extent is mathematical necessity demanded? (3) To what extent are both transmission- and acquisition-functions distributed to the student?

We found that across the Grade 1 to 4 texts that the demand for mathematically reflective judgement decreased substantially while simultaneously there was a substantial increase in the paradigmatic form of evaluation. In the case of the video records of pedagogic practice also found that there was a very low demand for mathematically reflective judgement and that pedagogic practice was dominated by the paradigmatic form of evaluation. When we examined the demand for the establishing of mathematical necessity we found that such demand was negligible in both the *Mathematics at work* texts and the video records of pedagogic practice.

What these results collectively reveal is firstly, that the students are rarely required to arrive at a point at which they establish mathematical necessity. Therefore, the image of the student as a self-regulating autodidact who "constructs" mathematical knowledge from an engagement with problems presented in extra-mathematical terms is questionable. Further, the predominance of the paradigmatic form of evaluation, which distributes the transmission-function to the teacher and the acquisition-function to the student, indicates that the pedagogic modality relies heavily on mathematical necessity having already been established external and prior to the encounter of the student with the content, so that the image of the student establishing mathematical necessity for themselves is, once again, questionable.

Note that here we are insisting on the establishing of mathematical necessity as a necessary element of the "construction" of mathematics contents. However, we are not claiming that it is necessary for the student, who is situated at a moment of the division of labour in education concerned with the reproduction of knowledge, to fully establish mathematical necessity. Our target here is the PCA claim that the student does (and must) "construct" the particular mathematics content.

That said, we might paradoxically add that we believe the PCA succeeds for the wrong reasons. By this we mean that the originators of the PCA have generated a pedagogic modality that allows itself to be duped by the ideological call for the dissolution of boundaries, but has simultaneously attempted to maintain its fidelity to mathematics. On the hand the PCA constructs a world of Imaginary relations structured along the lines of utilitarian moral regulation, but in the very next instant begins to disrupt that world in order to reassert the Symbolic in the guise of mathematics.

9.5 Limitations and potential of the work

Our research interest was framed in terms of a very specific theory of pedagogic discourse and while we believe that theory to be both rigorous and immensely productive, it remains a tiny corner of the sociology of education. Both nationally and internationally, Bernsteinian theory does not enjoy a large following and appears to rely on little pockets of scholars for its reproduction. Additionally, Bernstein's sociology of education exhibits a relatively "strong grammar" and demands a subjection to its own logic if it is to be used productively. That requirement makes Bernstein's sociology of education less attractive than more easily assimilated work in the field. Work that has a strong Bernsteinian base therefore runs the risk of largely being ignored.

There is always the problem with attempting to derive general propositions from the analysis of a single case. We have attempted to deal with that problem by always moving from the theory to the specific case. In arriving at the research hypothesis we started with the formulation of theoretical hypotheses deductively derived from antecedent theory. Next, we derived a set of empirico-theoretical hypotheses from our specification of the general content of the pedagogic device. The theoretical hypotheses construct the general theoretical ground for conducting the research and the empirico-theoretical hypotheses construct the general empirical background within which the particular pedagogic modality we investigate is situated and within which the research problem is finally completely defined.

In other words, we have attempted to approach the particular empirical features of the pedagogic modality engaged with by always proceeding from the general to the particular. Where the general proved inadequate for grasping the particular, as in the case of Bernstein's silence on the problematic of pleasure, we first located the place in the theory where supplementation was required and then introduced elements of Freudian and Lacanian theory to achieve the required supplementation. Also, where Bernstein's account of the evaluative rule of the pedagogic device proved too general for productive engagement with the empirical, Hegel was introduced so that the theory could begin to grasp the empirical more precisely.

Further, the theoretical and empirico-theoretical propositions were used as the ground from which an external language of description was produced for the production of data from the empirical texts and for the analysis of those texts. In that way we ensured that the theoretical terms and the relations established between them used in the analysis were already established at the more general level of the internal language of description. The expression of the results of the analysis are therefore closely related to the general.

With hindsight it becomes clear that what proved productive in our attempt to explain the particularities of a specific pedagogic modality was that it demanded the further elaboration of what was really implicit in the theory. The recruitment of pleasure and utility in the reproduction of school mathematics is merely a historically-specific particular. The theoretical account of pedagogic discourse in terms of the Imaginary-Symbolic dialectic could be done without under pedagogic conditions enjoying the observance of strong boundaries. Under conditions of strong boundary maintenance imaginary identification was dealt with relatively easily by appealing to paternal and other forms of authority as well as to the purity of disciplinary knowledge. Under conditions of weak boundaries, however, symbolic authority cannot be nakedly asserted because all that it provokes is an entrenchment of imaginary relations because pedagogic communication then becomes an antagonistic clash of egos.

One of the propositions that we announced at places in the body of the text, but could never directly engage with during this study, was the proposition that schooling offers the student pleasure (or the suspension of displeasure) in return for given up *jouissance*. That proposition, which has the status of a fundamental assumption here, was derived from Freud's general specification of education and, more importantly, from Lacan's theory of discourse in which he describes educating as constituting a very particular social bond, the so-called Discourse of the University. The Discourse of the University has a structure in which knowledge confronts the *jouissance* of the pedagogic subject and produces that subject as ultimately split, that is, as alienated. What makes the proposition fairly difficult to engage with empirically is that, if it is sound, then *jouissance* is, by definition of the Discourse of the University, driven underground in schooling so that we cannot easily see its working in texts of the type we have examined here. Beyond that difficulty, however, *jouissance* is of the Lacanian Real and so in some way escapes the Symbolic, and is also more productively approached at the level of the unconscious. Given the aforementioned difficulties, it is unlikely that the workings of *jouissance* can easily be empirically investigated within the context of education research. It would seem that the best we can do in education at this time is rely on formalisations derived from Lacanian psychoanalysis to construct models that take account of the place of *jouissance* but without investigating it directly.

As concerns future directions, the next step is to build on the work done here to construct a theoretical account of the desiring pedagogic subject within the pedagogic relation. It would seem that such work needs to start from a reconsideration of the relation between knowledge and its absence. A focus on the absence of knowledge is central because, as Lacan teaches us, ignorance is a place of enjoyment outside of the sphere of the Symbolic. The formulations we have produced here on the relation between knowledge and its absence are a merely a beginning.

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Appendix 1

The semantic rectangle

The semantic rectangle

Using Greimas' "semantic rectangle"[1], we can describe the set of semantic relations generated by any fundamental opposition (see Greimas, 1968, 1977 and 1985; Jameson, 1988). Greimas argues that

> the generation of signification does not pass first through the production of utterances and their combination in discourse; it is relayed, in following its course [...], by narrative structures which produce meaningful discourse in utterances. (1977: 24)

We first note that Greimas proposes a system of logical relations for the description of what he calls the *taxonomic core*, or *model*, of narrative grammars; that is, the fundamental semantic organisation of a discursive production. Here we also draw attention to the use of such a device in the work of Jameson (1981, 1988, 1992), in particular, as well as other scholars (for example, Clifford, 1988; Žižek, 1991), who have used the semantic rectangle to generate descriptions of the fundamental semantic elements at work in diverse fields and texts.

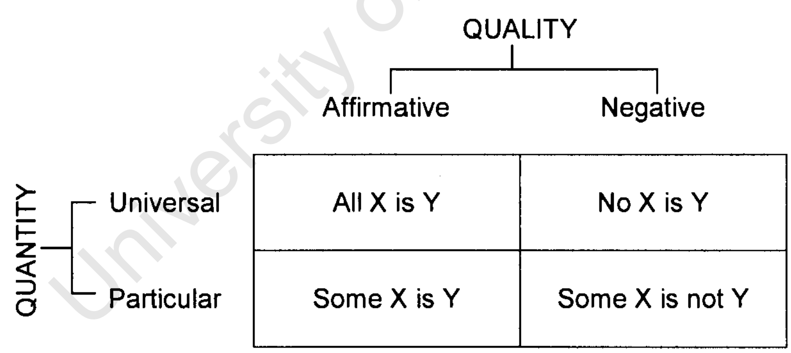

Figure A1.1: the logical rectangle

Greimas' semantic rectangle is derived from the so-called "logical rectangle" (or "square of opposition") of the scholastics that relates categorical statements of a subject-predicate form in terms of *quality* and *quantity*. In a categorical statement, quality is either *affirmed* or *negated*, while quantity can be either *universal* or *particular*. The logical rectangle produces a matrix of four possibilities that can be represented diagrammatically as in Figure A1.1. If we take X as subject and Y as predicate, then the four possibilities are: (1) All X is Y; (2) No X is Y; (3) Some X is Y; and (4) Some X is not Y

[1] Often also referred to as the "semiotic square" or the "semiotic rectangle".

(Kneebone, 1963). Relations between pairs of propositions are defined as follows: (1) and (2) are the contraries; (3) and (4) are the sub-contraries; the pairs (1) and (4), and (2) and (3) are the contradictories; and the pairs (1) and (3), and (2) and (4) are the subalterns. Figure A1.2 shows the relations between the pairs of propositions expressed in terms of contradictories, contraries and subalterns.

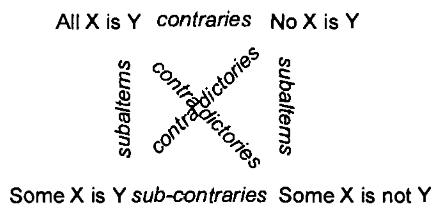

Figure A1.2: The logical rectangle, 2

While the logical rectangle can clearly be generated from any of the four propositions, Greimas appropriates the rectangle as a model for the elementary structure of signification but starts from an initial *binary opposition.* Since the axes of contrariety are considered to be axes of *opposition* rather than a relation of simple logical negation, Greimas argues that any pair of binarily opposed terms can serve as the generative contrary relation of the elementary structure of signification of a narrative. As an example of what is meant here, we turn to Jameson's (1981: 254) discussion of Joseph Conrad's novel *Lord Jim.*

For Jameson, following Greimas, a specific opposition at work in a text—in this instance that between "Activity" and "Value"—need not be an expression of "logical accuracy"[2]:

> The point about this binary opposition, however, is not its logical accuracy as a thought concerned to compare only comparable entities and oppose only terms of the appropriate category, but, on the contrary, its existence as a symptom; the opposition between activity and value is not so much a logical contradiction, as rather an antinomy for the mind, a dilemma, an aporia, which itself expresses—in the form of an ideological closure—a concrete social contradiction.

The initial binary opposition is that from which the relations of contradiction (that is, the relations of simple logical negation) are generated by taking one term at a time. So, for example, in Jameson's discussion of *Lord Jim*, "Activity" and "Value" generate "Not-Activity" and "Not-Value", respectively (see Figure A1.3 (ibid.: 254)).

We can now attend to the composition of the Greimassian taxonomic model in more detail. The model is a structure of four mutually interdefined terms in a network of precise relations referred to as a *correlation* between two *schemas*. The relations Activity—Not-Activity and Value—Non-Value are

[2] Here we have a statement grounding meaning in the occulting of a social contradiction and is consistent with Greimas' (1977) argument that the elementary signification structure is (re)productive of axiologies (value-systems) and ideologies (recurrent processes of value-creation) if we understand ideology as another name for such occulting (cf. Laclau & Mouffe, 1985). Further, the so-called "deconstruction" of any given binary opposition is predicated on the assumption of the necessary operation of ideology in the assertion of a binary opposition but cannot banish from social practice the operation of ideology and binary opposition.

examples of schemas. A schema is therefore to be understood as a structure including two terms in a *relation of contradiction.* The correlation is a relation between two schemas such that, when we take the terms of the schemas one at a time, they are in a *relation of contrariety* with the corresponding terms of the other schema. So the relations Activity—Value, and Not-Value—Not-Activity are relations of contrariety. The difference between contraries and contradictories is defined in terms of exclusiveness and exhaustiveness: the contraries are mutually exclusive but not exhaustive, while the contradictories are mutually exclusive and exhaustive. The relation between an element of a schema and the contradictory of its contrary is a *complementary* relation (Greimas, 1977).

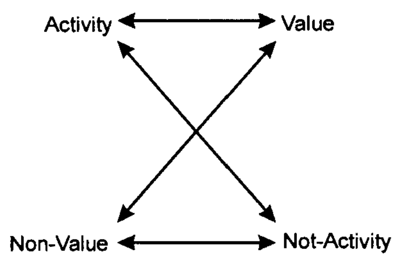

Figure A1.3: Activity-Value

The four terms of the rectangle do not serve as placeholders for characters in Jameson's discussion since they are conceptual features or *semes* rather than characters. Characters are associated with pairs of terms to generate a *character system* which is represented schematically as an extended semantic rectangle in Figure A1.4 (ibid.: 256). Value and Not-Activity are embodied by the pilgrims; Not-Value and Not-Activity by the self-serving, lazy "deck-chair sailors"; Activity and Not-value in the nihilism of the buccaneer; and Activity and Value in Jim (ibid.: 254-5).

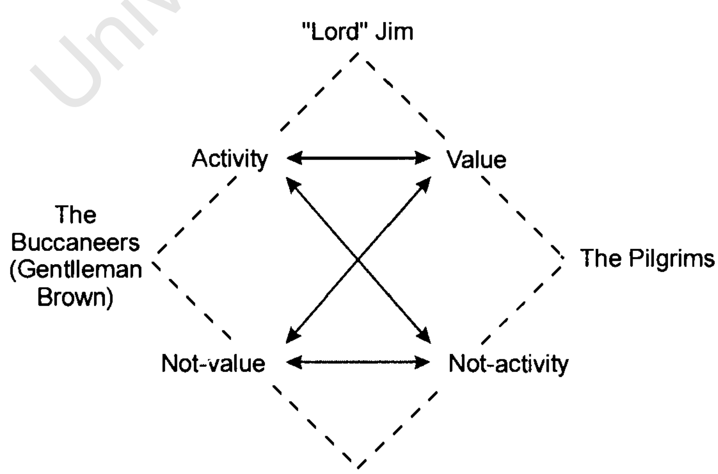

Figure A1.4: Activity-Value system

While Culler (1975) has pointed out the numerous problems that inhere in Greimas' narrative theory with respect to the generation of a description of an entire narrative from the elementary structure, his criticisms nevertheless do not dismiss the theoretical and analytic importance of the elementary structure, but raise serious doubts about Greimas' claim to having developed an algorithmic procedure, derived primarily from the elementary structure, for the description and analysis of narrative. Culler demonstrates that the elementary structure, while productive in orienting the reader or analyst in their attempts at constructing isotopic coherence, is not sufficient to generate a description of a complex narrative structure without the incorporation of additional semiotic and linguistic resources. This requirement is apparent in Jameson's discussion of *Lord Jim* in the fact that the character system cannot be automatically generated by the initial opposition (Activity—Value) and makes sense only after the reader is taken through an extended and elaborate argument that is dependent on resources drawn from fields other than semiotics and semantics. Indeed the generation of the initial opposition is itself dependent on the employment of extra-semiotic resources. The analytic value of the semantic rectangle resides in its use as a structuring device that enables us to develop a coherent account of the generative oppositions that establish the semantic universe of a text.

Appendix 2

Analytic description of the tasks engaged with in the video records

English-medium private school for girls, Grade 2

Task 1

Mum was picking flowers. She picked 27 flowers and put them in 6 vases. How many flowers did she put in each vase?

RMR: Picking and arranging flowers. (~M)

MR: Iconic text showing distribution of flowers. (~M)

Notion: Division of positive integers, with remainder. Here the "notion" functions as a proto-notion.

Reflection: Yes, arising from (1) the rule, inserted by the teacher, that each vase was to contain an equal number of flowers, and (2) the fact that 27 is not divisible by 6.

Necessity: No. While distributing flowers to vases can be described in terms of division, it is not division as such.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

English-medium private school for girls, Grade 3

Task 2

Mr and Mrs. Jones and their four children came from Durban to see the concert. Each ticket cost R195. How much did Mr Jones pay for his family?

RMR: Cost of tickets for a rock concert. (~M)

MR: A multiplicative product expressed in Rands and cents. (M, ~M)

Notion: Multiplication of positive integers.

Reflection: No. Standard multiplication "word problem".

Necessity: No. Established prior to the encounter with the problem.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 3

Calculate the number of people transported by 96 buses, each carrying 42 people.

RMR: Transporting people by bus. (~M)

MR: A multiplicative product expressed in terms of a quantity of people. (M, ~M)

Notion: Multiplication of positive integers.

Reflection: No. Standard multiplication "word problem".

Necessity: No. Established prior to the encounter with the problem.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Afrikaans-medium public school, Grade 2

Task 4

Mum bought 96 marbles of which 48 were red. Half of the amount was green and the rest were blue.

1. How many blue marbles were there?

2. How many more red marbles than blue marbles were there?

3. If each marble cost 4 cents, how much did Mom pay for the green marbles?

4. Mum divided the marbles equally amongst Jonathan, Peter and Isaac. How many marbles did each of them get?

5. Peter loses a quarter of his marbles. How many does he have left?[3]

Task 4.1

How many blue marbles were there?

RMR: A mother supplying children with red, green and blue marbles. Collection of blue marbles. (~M)

MR: A calculation of the number of blue marbles. (M, ~M)

Notion: Half.

Reflection: Not apparent, despite the fact that the narrative which sets the extra-mathematical context is nonsensical in the light of the privileged solutions.

Necessity: No. The establishing of necessity would have produced an answer of 0 blue marbles, not 24.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 4.2

How many more red marbles than blue marbles were there?

RMR: A mother supplying children with red, green and blue marbles. Collections of red and blue marbles. (~M)

MR: A calculation of the number of red marbles. (M, ~M)

[3] Recall that the task was expressed in Afrikaans in the original: "Mama het 96 albasters gekoop, waarvan 48 rooi was. Die helfte van die getal was groen en die res was blou. 1. Hoeveel blou albasters was daar? 2. Hoeveel was die rooi albasters meer as die blou albasters? 3. As elke albaster vier sent gekos het, hoeveel het Mama vir die groen albasters betaal? 4. Mama het die albasters gelykop verdeel tussen Johan, Piet en Isak. Hoeveel albasters het elkeen gekry? 5. Pieter verloor 'n kwaart van sy albasters. Hoeveel het hy nou oor?"

Notion: Subtraction.

Reflection: No. Standard subtraction "word problem".

Necessity: No. Established prior to the encounter with the problem. The establishing of necessity would have produced an answer of 48, not 24.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 4.3

If each marble cost 4 cents, how much did Mum pay for the green marbles?

RMR: A mother supplying children with red, green and blue marbles. Cost of green marbles. (~M)

MR: A calculation of the cost of green marbles. (M, ~M)

Notion: Multiplication.

Reflection: No. Standard multiplication "word problem".

Necessity: No. Established prior to the encounter with the problem. The establishing of necessity would have produced an answer of R1,96c, not 96c.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 4.4

Mum divided the marbles equally amongst Jonathan, Peter and Isaac. How many marbles did each of them get?

RMR: A mother supplying children with red, green and blue marbles. Sharing of marbles. (~M)

MR: Number of marbles received by a child. (M, ~M)

Notion: Division.

Reflection: No. Standard division "word problem".

Necessity: Established prior to the encounter with the problem.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 4.5

Peter loses a quarter of his marbles. How many does he have left?

RMR: A mother supplying children with red, green and blue marbles. Loss of marbles by Peter. (~M)

MR: Number of marbles in the possession of Peter. (M, ~M)

Notion: Quarter.

Reflection: No. Standard division "word problem".

Necessity: No. Established prior to the encounter with the problem.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

English-medium Cape Flats public school, Grade 2

Task 5

Exploring the structure of the number 13.

Task 5.1

Count out 13 plastic blocks.

RMR: Enumerating a collection of plastic blocks. (~M)

MR: Sequence of numbers from 1 to 13. (M)

Notion: Counting.

Reflection: No.

Necessity: No. Established prior to the encounter with the problem.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 5.2

Find the number 13 on a 100-square.

RMR: 100-square. (M)

MR: Sequence of numbers from 1 to 13. (M)

Notion: Counting.

Reflection: No.

Necessity: No. Established prior to the encounter with the problem.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 5.3

How many 10s are there in 13? (M)

RMR: 100-square.

MR: A single 10 in 13.

Notion: Decomposition of 13 as 10 + 3.

Reflection: Yes, but resulting from the teacher's repetition of the question of how many 10s there are in 13 which produces confusion for the students. Hence the reflection is focused on what the teacher wants as an answer rather than mathematics.

Necessity: No. The function of 0 in a place-value number system remains implicit as does the fact that the students are dealing with base-10 counting.

Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

English-medium Cape Flats public school, Grade 3

Task 6

I'm buying six little ice-creams, called mini-ice-creams, twenty-eight cents each. How much is that going to cost me?

RMR: Buying ice-cream. (~M)
MR: Cost of ice-cream. (M, ~M)
Notion: Multiplication of positive integers.
Reflection: No. Standard multiplication "word problem".
Necessity: No. Established prior to the encounter with the problem.
Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 7

23 big ice-creams, 49c each.

RMR: Buying ice-cream (implied). (~M)
MR: Cost of ice-cream (implied). (M, ~M)
Notion: Multiplication of positive integers.
Reflection: No. Standard multiplication "word problem".
Necessity: No. Established prior to the encounter with the problem.
Subject-positions: teacher as transmitter; student as acquirer. Paradigmatic evaluation.

Task 8

Identification of multiplication problems listed in Figure A2.1 that students do not know the answers to and the production of procedures for the solution of those problems.

4 x 9	8 x 8
7 x 9	6 x 7
4 x 8	5 x 9
8 x 7	9 x 8
7 x 7	9 x 6
8 x 9	9 x 9
10 x 8	11 x 11
3 x 40	12 x 10
30 x 50	4 x 400
400 x 60	80 x 70

Figure A2.1: Human's multiplication problems

RMR: Standard multiplication problem expressed in mathematical terms. (M)

MR: Number. (M)

Notion: Multiplication.

Reflection: Yes. Production of different solution procedures at the level of expression.

Necessity: No. Established prior to the encounter with problems.

Subject-positions: student as transmitter; student as acquirer; other.

Appendix 3

Movement of the judgement and distribution of subject-positions, Grade 1

Task #	*Mathematics at work, Grade 1* Task title & [mathematical content]	Missing representation		Movement of the notion: Representation of the missing representation		Movement of the notion			Subject-positions: Transmission-function			Subject-positions: Acquisition-function			Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
		M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW1T01	With my teacher [counting]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T02	Feeding time [counting, 1-1 correspondence]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T03	Animals [counting]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T04	Playing [counting]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T05	Girls and boys [counting]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T06	More [counting]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T07	Less [counting]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T08	How long? [counting, measure]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T09	A long time, a short time [measure]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T10	Cars [counting]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T11	Sweets [counting]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T12	Hens [counting]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T13	Shapes [geometry]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW1T14	Heavy and light [mass]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T15	Feeding time again [counting]	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T16	Sharing chocolate [fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T17	Some more [counting on]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T18	Some less [counting back]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T19	Swimming [numerical relations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T20	Your own stencil [geometry: plane figures]	0	1	1	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW1T21	Baking [counting: grouping]	1	0	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T22	Fruit [counting: grouping]	1	0	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T23	More or less [counting on/back]	1	1	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T24	The same [equality]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1

Task #	*Mathematics at work, Grade 1* Task title & [mathematical content]	Missing representation		Movement of the notion: Representation of the missing representation					Subject-positions: Transmission-function			Acquisition-function			Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
		M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW1T25	Making equal [equations]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T26	In the garden [counting on]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T27	Faisal's animals [counting: grouping, division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T28	Eggs [counting: grouping, division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T29	Biscuits [counting: grouping, division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T30	Flow diagram [operators: addition]	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T31	Half [fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T32	Making new shapes [geometry: composite plane figures]	0	1	1	0	1	0	0	1	0	0	1	0	0	0	1	0	1	0	0
MW1T33	Faisal's animals again [equations]	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T34	Sharing bread [division, fractions]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T35	Double [multiplication by 2]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T36	Some more doubles [multiplication by 2]	1	1	0	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T37	Summer [multiplication]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T38	Winter [division, fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T39	Sharing chocolate again [division, fractions]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T40	Getting to school [numerical description]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T41	Chickens [counting back, subtraction]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T42	More eggs [grouping, division]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T43	How long? How far? [measure: linear]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T44	More flow diagrams [operators: addition, doubling]	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T45	Number patterns [sequences]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T46	More and less [equations: subtraction]	1	0	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T47	Sita's birthday [counting on: addition]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T48	Money [numerical combinations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1

Task #	*Mathematics at work, Grade 1* — Task title & [mathematical content]	Missing representation: M	Missing representation: ~M	Movement of the notion — Representation of the missing representation: M	Movement of the notion — Representation of the missing representation: ~M	Movement of the notion — Reflection	Movement of the notion — Necessity	Movement of the notion — Notion	Subject-positions — Transmission-function: T	Subject-positions — Transmission-function: S	Subject-positions — Transmission-function: O	Subject-positions — Acquisition-function: S-S	Subject-positions — Acquisition-function: S-O	Subject-positions — Acquisition-function: O	Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
MW1T49	Buns [multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T50	Cats and cars [multiplication]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T51	Counting money [grouping: addition, multiplication]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T52	Saving cents [grouping: addition, multiplication]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T53	Sharing worms [grouping: division]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T54	Chocolate [grouping: multiplication]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T55	Shopping [addition, subtraction, numerical combinations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T56	More shopping [subtraction]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T57	Flowers [division with remainder]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T58	Tables without legs [numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T59	Belinda's party [division, multiplication]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T60	More tables without legs [numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T61	Finding shapes [geometry: composite plane figures]	1	1	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T62	Sharing chocolate again [division, fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T63	Naming parts [fractions]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T64	Hungry birds [numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T65	Hungry cats [numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW1T66	Birthdays [numerical description]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T67	How much cooldrink? [volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T68	Selling fruit [subtraction]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T69	Matchbox towers [volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T70	Cutting open [geometry: nets]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T71	More sweets [division, combinations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T72	Sweets again [addition, subtraction]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1

Task #	Task title & [mathematical content]	Missing representation		Representation of the missing representation		Movement of the notion			Subject-positions						Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
	Mathematics at work, Grade 1								Transmission-function			Acquisition-function								
		M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW1T73	Number pyramids [addition]	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW1T74	Carpets [area]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T75	Hungry rabbits [numerical relations]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T76	Boxes [volume]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T77	Riddles [numerical relations]	1	1	1	1	1	1	1	0	1	0	1	1	0	0	1	1	0	1	0
MW1T78	Oranges [numerical relations]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T79	The best buy [combinations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW1T80	Fair and unfair [division]	1	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	1	0	0
		58	**67**	**17**	**72**	**49**	**1**	**76**	**79**	**1**	**0**	**80**	**1**	**0**	**29**	**49**	**47**	**2**	**1**	**37**
		72.5%	83.8%	21.3%	90.0%	61.3%	1.3%	95.0%	98.8%	1.3%	0.0%	100.0%	1.3%	0.0%	36.3%	61.3%	58.8%	2.5%	1.3%	46.3%
																wrt reflection:	95.9%	4.1%	2.0%	75.5%

Task #	Task title & [mathematical content]	Missing representation		Representation of the missing representation		Movement of the notion			Subject-positions: Transmission-function			Subject-positions: Acquisition-function			Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
	Mathematics at work, Grade 2	M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW2T001	With my teacher [counting]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T002	I can count numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T003	Pots and dots [numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T004	Tables without legs [numerical relations]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T005	Sharing sweets [division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T006	Shoes [numerical relations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T007	Selling fruit 1 [subtraction]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T008	Selling fruit 2 [addition]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T009	Selling fruit 3 [subtraction]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T010	Your own stencil [geometry: composite plane figures]	1	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	1	0	0
MW2T011	Packing fruit [division]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T012	Money 1 [combinations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T013	Flow diagrams [operators: addition, subtraction]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T014	Sharing chocolate 1 [fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T015	Sharing money [division, multiples]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T016	Double [multiplication: doubling]	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T017	Measure [measure: linear]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T018	Making equal [equations]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T019	Buying sweets [division]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T020	More sweets [division, combinations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T021	Choosing fruit [combinations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T022	Counting money [addition]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T023	Counting more money [numerical description]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

				Movement of the notion					Subject-positions											
Task #	*Mathematics at work, Grade 2* Task title & [mathematical content]	Missing representation		Representation of the missing representation					Transmission-function			Acquisition-function			Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
		M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW2T024	Making equal [equations]	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T025	At school [division, multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T026	In the classroom 1 [division, multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T027	In the classroom 2 [geometry: coordinates]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T028	Sharing chocolate 2 [fractions]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T029	Who gets more? [fractions]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T030	Giving names [fractions]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T031	Fair or unfair? [fractions]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T032	At the river 1 [division, multiplication]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T033	At the river 2 [fractions]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T034	Centimetres and metres [measure: linear]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T035	Measuring in centimetres [measure: linear]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T036	How big? (A class activity) [measure: linear]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T037	Metres [measure: perimeter, area]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T038	Hungry rabbits 1 [numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T039	Hungry rabbits 2 [numerical relations]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T040	Hungry rabbits 3 [numerical relations]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T041	Wake up! [measure: temporal]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T042	Minutes and hours [measure: temporal]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T043	Baking [counting, grouping]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T044	How many? [multiplication]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T045	A short way of writing [multiplication]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T046	A quick meal [multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

				Movement of the notion					Subject-positions											
Task #	*Mathematics at work, Grade 2* Task title & [mathematical content]	Missing representation M	Missing representation ~M	Representation of the missing representation M	Representation of the missing representation ~M	Reflection	Necessity	Notion	Transmission-function T	Transmission-function S	Transmission-function O	Acquisition-function S-S	Acquisition-function S-O	Acquisition-function O	Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
MW2T047	Belinda's flapjacks [combinations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T048	A cold evening [division, fractions, multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T049	Shapes [geometry: 3 dimensional objects]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T050	Paving [multiplication]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T051	Heavy and light [measure: mass]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T052	Grams and kilograms [measure: mass]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T053	Carpets [measure: area]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T054	More carpets [measure: perimeter, area]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW2T055	Getting fit [multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T056	Soccer [division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T057	Rugby [division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T058	A sports day [multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T059	Cutting open [geometry: nets]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T060	Number pyramids [addition]	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T061	Getting to school 1 [numerical description]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T062	Even and uneven [numbers]	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T063	Getting to school 2 [measure: linear]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T064	Cooldrink and water [measure: volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T065	Millilitres and litres [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T066	Lots of fruit [division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T067	Lots of milk [multiplication, volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T068	Multiples 1 [integral multiples]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW2T069	Building towers [measure: volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Task #	Task title & [mathematical content]	Missing representation		Movement of the notion: Representation of the missing representation		Movement of the notion			Subject-positions: Transmission-function			Subject-positions: Acquisition-function			Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
	Mathematics at work, Grade 2	M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW2T070	Shells [geometry: shape]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T071	A day [measure: temporal]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T072	A hot day [division]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T073	How long? [measure: temporal]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T074	How long again? [measure: temporal]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T075	Inside secrets [geometry: dissection]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T076	We need sleep [measure: temporal]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T077	Money 2 [currency]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T078	Saving money [multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T079	Making toys to sell 1 [subtraction, multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T080	Making toys to sell 2 [subtraction, multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T081	Where to sell? [retailing]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T082	A trip to the beach 1 [multiplication, division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T083	A trip to the beach 2 [multiplication, division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T084	Multiples 2 [multiples]	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T085	Hot and cold [temperature]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T086	Too hot and too cold [temperature]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T087	Making porridge [numerical relations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T088	Secret numbers [numerical relations]	1	0	1	1	1	1	1	1	1	0	1	1	0	0	1	1	0	1	0
MW2T089	Marga's porridge [numerical relations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T090	Kilometres [measure]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T091	On holiday 1 [measure: linear]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T092	On holiday 2 [measure, numerical description]	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

	Mathematics at work, Grade 2			Movement of the notion						Subject-positions											
		Missing representation		Representation of the missing representation					Transmission-function			Acquisition-function			Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
Task #	**Task title & [mathematical content]**	M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW2T093	Sandwiches for school [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T094	Sandwiches [numerical description]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T095	Some more towers [measure: volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T096	The best buy 1 [comparison: shopping]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T097	The best buy 2 [comparison: shopping]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T098	Road signs 1 [measure: linear]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T099	Road signs 2 [geometrical description]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW2T100	100 is a special number [multiples]	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW2T101	Free time [moral order]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
		62	**91**	**28**	**95**	**26**	**1**	**89**	**101**	**1**	**0**	**101**	**1**	**0**	**64**	**26**	**25**	**1**	**1**	**12**
		61.4%	90.1%	27.7%	94.1%	25.7%	1.0%	88.1%	100.0%	1.0%	0.0%	100.0%	1.0%	0.0%	63.4%	25.7%	24.8%	1.0%	1.0%	11.9%
																wrt reflection:	96.2%	3.8%	3.8%	46.2%

Appendix 5

Movement of the judgement and distribution of subject-positions, Grade 3

	Mathematics at work, Grade 3	Missing representation		Movement of the notion: Representation of the missing representation		Movement of the notion			Subject-positions: Transmission-function			Subject-positions: Acquisition-function			Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
Task #	Task title & [mathematical content]	M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
MW3T001	Onions! [factors]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T002	Untidy numbers [prime numbers]	1	0	0	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	1
MW3T003	New learners [division]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T004	Lots of eggs [division]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T005	Money [combinations]	0	1	0	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	1
MW3T006	At the post office [multiplication]	0	1	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0
MW3T007	Peaches [multiplication, operators]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T008	Sharing chocolate [fractions]	0	1	0	1	1	0	1	0	1	0	0	1	0	0	1	1	0	0	1
MW3T009	Sausages for all 1 [fractions]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T010	Bits and pieces1[fractions]	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW3T011	Your own stencil1[geometry: plane figures]	1	1	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T012	Money for tuck 1 [multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T013	Money for tuck 2 [numerical relations]	0	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T014	Moosa's shop [numerical relations]	1	1	1	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	0
MW3T015	More eggs [numerical relations]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T016	Tiling a surface 1 [tessellations]	1	0	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T017	What the bees know [tessellations]	1	0	0	1	1	0	1	1	1	0	1	0	1	0	1	1	0	0	1
MW3T018	Lots of money [combinations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T019	Sausages for all 2 [fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T020	Bags full of numbers [equations]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T021	Apples and eggs [division]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T022	Lots of stamps [multiplication]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1

MW3T023	Shopping at Moosa's [combinations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T024	Number pyramids [addition]	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T025	Working on Saturdays [division]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T026	Fingers, hands and feet [measure: length]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T027	Centimetres [measure: length]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T028	Metres [measure: length]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T029	Growing taller [measure: length]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T030	Holiday clothes [measure: length]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T031	Mix and match [combinations]	0	1	1	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	0
MW3T032	Fencing [measure perimeter]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T033	Paving [measure: area; multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T034	The school concert [co-ordinates]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T035	The soccer season [measure: perimeter; numerical relations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T036	Looking down from above [geometry: orthogonal projections]	1	0	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T037	More blocks [numerical relations]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T038	Floor plans [geometry: orthogonal projections]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T039	Water problems [addition, division]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T040	Playing netball [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T041	A great big party! [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T042	Another great big party! [numerical relations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T043	Ice cream [fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T044	Toys out of wire [numerical relations]	1	1	1	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	0
MW3T045	Which would you rather have? [fractions]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T046	Hours and minutes [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T047	At the clinic [measure: time]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T048	Good medicine [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T049	More bits and pieces [fractions]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T050	How long does it take? [measure: time]	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0
MW3T051	Different numbers, the same time [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T052	A year is a long time [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T053	Buying stamps [combinations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T054	Cakes and chocolate [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW3T055	How to make a water bomb [geometrical construction: 3D]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW3T056	Tiling a surface 2 [tessellations]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T057	At the hardware shop [multiplication; addition]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T058	Chips and cooldrinks [numerical description]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T059	More bar charts [numerical description]	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T060	Going on a trip [multiplication; division]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T061	At the fun fair [combinations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T062	Sharing prize money [fractions]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T063	A class party [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T064	How much longer? [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T065	Rugby matches [measure: time]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T066	Make a paper cup [geometrical construction: 3D]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T067	Bubble mix 1 [numerical relations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T068	Bubble mix 2 [numerical relations]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T069	Busy times at the clinic [[statistical description]	0	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T070	What is left? [odd numbers]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T071	Milk, cooldrink and water [measure: volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T072	Wasting money [measure: volume]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T073	Litres and millilitres [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T074	Painting! [measure: volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T075	How to make a pyramid [geometrical construction: 3D]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW3T076	Magic boxes [geometrical construction: 3D]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW3T077	How old are you? [measure: time]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T078	Pascal's triangle [numerical relations]	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T079	Lots of paint [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T080	Leftover paint [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T081	More untidy numbers [prime numbers]	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW3T082	I am heavier than you are [measure: mass]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T083	Kilograms [measure: mass]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T084	A school supper [measure: mass]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T085	Loaded up [measure: mass]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T086	Yummy leftovers [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW3T087	Is it true? [fractions]	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T088	The tooth mouse and the tooth fairy [numerical relations]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T089	Chocolate cake [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T090	Mrs Sishuba's birthday [addition, multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T091	Sharing [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T092	Spending time [fractions]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T093	Very tidy numbers [square integers]	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW3T094	Baking biscuits [multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T095	Cold things for hot days [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T096	Helping on the farm [numerical relations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T097	Making a profit [multiplication, subtraction]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T098	A sports day — what to ask? [numerical description]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T099	Paths [circle and square]	0	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T100	Centuries [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T101	To the cinema [measure: time]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T102	Ordering stamps [multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T103	Fillings for sandwiches [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T104	Posting parcels [measure: mass]	1	1	0	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	1
MW3T105	Posting letters [measure: mass]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T106	A party at break [combinations]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T107	Twirling shapes [geometrical transformations]	0	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T108	Jelly! [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T109	More jelly [combinations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T110	To market 1 [measure: mass]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T111	To market 2 [measure: mass]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T112	Choosing [combinations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T113	Cooldrink for a picnic [measure: volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T114	Looking for shapes [tessellations]	1	1	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T115	Mixing cooldrink [measure: mass and volume]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T116	New netball courts [measure: perimeter]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T117	A whole day's sport [division]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T118	Paving slabs [measure: area]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW3T119	Wooden toys [measure: length]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T120	120 is a special number [multiples]	1	0	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW3T121	A camping trip 1 [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T122	A camping trip 2 [fractions]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T123	More cooldrink mixing [numerical relations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T124	Watching television [measure: time]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T125	More television [measure: time]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T126	Pocket money [measure: time]	1	1	0	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	1
MW3T127	What shows? [geometrical construction: 3D]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T128	At the farm stall 1 [measure: time; multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T129	At the farm stall 2 [fractions]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T130	Soccer [multiplication]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T131	A long way 1 [measure. length]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T132	A long way 2 [measure: length and time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T133	A long way 3 [measure: length and time]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T134	The shortest way 1 [measure: length]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T135	The shortest way 2 [measure: length]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T136	The shortest way 3 [measure: length]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T137	Toffees [estimation]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T138	Drinking tea [numerical relations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T139	More toffees [multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T140	Spring flowers [multiplication]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T141	The toffee factory [numerical relations]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T142	Packing toffees [measure. volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T143	I don't believe it! [measure: length]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T144	What do I get? [measure: mass]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T145	Different watches 1 [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T146	Different watches 2 [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T147	Ordering for next year [multiplication]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T148	More orders [division]	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T149	Window-shopping [subtraction]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T150	A thousand is a big number! [measure: volume]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1

MW3T151	Cape Town to Pretoria 1 [measure: time]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T152	Cape Town to Pretoria 2 [measure: time]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T153	Going shopping [combinations]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T154	Chocolate sums [measure: volume]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T155	Another visit to George [measure: length]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T156	Pretoria to Cape Town [measure: length]	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T157	Secrets inside [geometrical description]	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW3T158	Going fishing [measure: mass, volume, length]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW3T159	A sandwich puzzle [measure: mass]	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW3T160	The holidays are coming [measure: time]	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
		92	150	32	153	58	3	156	158	11	0	158	10	1	96	58	58	0	3	35
		57.5%	93.8%	20.0%	95.6%	36.3%	1.9%	97.5%	98.8%	6.9%	0.0%	98.8%	6.3%	0.6%	60.0%	36.3%	36.3%	0.0%	1.9%	21.9%
																wrt reflection:	100.0%	0.0%	5.2%	60.3%

Appendix 6

Movement of the judgement and distribution of subject-positions, Grade 4

Mathematics at work, Grade 4

Unit	Missing representation		Representation of the missing representation		Movement of the notion			Subject-positions						Paradigmatic form of evaluation	Evaluation demanding reflection	Evaluation demanding reflection associated with mathematics	Evaluation demanding reflection associated with only non-mathematical notions	Evaluation demanding that mathematical necessity be established (entails reflection)	From non-mathematical representation to mathematical reflection
								Transmission-function			Acquisition-function								
	M	~M	M	~M	Reflection	Necessity	Notion	T	S	O	S-S	S-O	O						
Module 1: Comparing houses. Unit 1: A new house for the Nhlapo family. MW4M01U01T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M01U01T02	0	1	0	1	1	0	1	1	0	0	1	1	0	0	1	1	0	0	1
MW4M01U01T03	0	1	0	1	1	0	1	1	0	1	1	1	0	0	1	1	0	0	1
MW4M01U01T04	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Unit 2: Vusi and Felicity think again. MW4M01U02T01	0	1	0	1	1	0	1	1	0	1	1	0	0	0	1	1	0	0	1
MW4M01U02T02	0	1	0	1	1	0	0	1	0	0	1	1	0	0	1	0	0	0	0
MW4M01U02T03	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M01U02T04	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
Unit 3: Looking more carefully at the sizes of the two houses. MW4M03U03T01	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U03T02	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M03U03T03	1	1	1	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	0
MW4M03U03T04	1	0	1	0	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW4M03U03T05	1	0	1	0	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW4M03U03T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Unit 4: Two new schools. MW4M01U04T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M01U04T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M01U04T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M01U04T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M01U04T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M01U04T06	1	0	1	0	1	0	1	1	1	0	1	0	0	0	1	1	0	0	0
Module 2: Let's investigate. Unit 1: Chairs and notes. MW4M02U01T01	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M02U01T02	0	1	0	1	1	0	1	0	1	0	0	1	0	0	1	1	1	0	1
MW4M02U01T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U01T04	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 2: Flow diagrams. MW4M02U02T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U02T02	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M02U02T03	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M02U02T04	1	0	1	0	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW4M02U02T05	1	0	1	0	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW4M02U02T06	1	0	1	0	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
MW4M02U02T07	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U02T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 3: Addition. MW4M02U03T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U03T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U03T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U03T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 4: Nine and ninety-nine. MW4M02U04T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M02U04T02	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M02U04T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U04T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M02U04T05	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M02U04T06	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M02U04T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5: Handshakes. MW4M02U05T01	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M02U05T02	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
Module 3: The Tendele Environment Project. Unit 1: Our trees. MW4M03U01T01	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M03U01T02	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M03U01T03	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M03U01T04	0	1	0	1	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0
MW4M03U01T05	0	1	0	1	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0
MW4M03U01T06	0	1	0	1	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0
Unit 2: Working in the environment. MW4M03U02T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U02T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U02T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U02T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 3: More environment trips. MW4M03U03T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U03T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 4: Janet plans food supplies. MW4M03U04T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U04T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U04T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

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	MW4M03U04T04	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0
	MW4M03U04T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5: Counting money.	MW4M03U05T01	0	1	0	1	1	0	1	0	1	0	0	1	0	0	1	1	1	0	1
	MW4M03U05T02	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	MW4M03U05T03	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
	MW4M03U05T04	0	1	0	1	1	0	1	0	1	0	0	1	0	0	1	1	1	0	1
	MW4M03U05T05	0	1	0	1	1	0	1	0	1	0	0	1	0	0	1	1	1	0	1
	MW4M03U05T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U05T07	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U05T08	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U05T09	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U05T10	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 6: Number snakes.	MW4M03U08T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U08T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U08T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U08T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U08T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U08T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U08T07	1	0	1	0	1	1	1	1	0	0	1	0	0	0	1	1	0	1	0
Unit 7: Counting in groups.	MW4M03U07T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U07T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U07T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M03U07T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M03U07T05	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M03U07T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 8: Troubles during an environment trip. MW4M03U08T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW4M03U08T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T09	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T10	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T11	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M03U08T12	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Module 4: Pieces of mathematical history. Unit 1: Measuring with a traditional unit. MW4M04U01T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T02	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M04U01T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T07	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T08	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T09	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M04U01T10	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T11	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T12	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T13	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T14	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T15	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T16	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U01T17	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 2: Measuring something in shiribi. MW4M04U02T01	0	1	1	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0
MW4M04U02T02	0	1	1	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0
MW4M04U02T03	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U02T04	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U02T05	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U02T06	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M04U02T07	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 3: Some number history. MW4M04U03T01	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M04U03T02	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M04U03T03	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M04U03T04	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M04U03T05	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M04U03T06	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
Module 5: Keeping track. Unit 1: Number and data on an egg farm. MW4M05U01T01	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M05U01T02	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0

MW4M05U01T03	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M05U01T04	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M05U01T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U01T06	0	1	0	1	1	0	1	1	1	0	1	1	0	0	1	1	0	0	1
MW4M05U01T07	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U01T08	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U01T09	0	1	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0
Unit 2: The roadside stall. MW4M05U02T01	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M05U02T02	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M05U02T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T04	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M05U02T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T07	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T08	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T09	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T10	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T11	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T12	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U02T13	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
Unit 3: Talking and writing about addition 1. MW4M05U03T01	1	0	1	0	1	0	1	0	1	0	0	1	0	0	1	1	1	0	0
MW4M05U03T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U03T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Unit 4: Talking and writing about addition 2. MW4M05U04T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U04T02	1	0	1	0	1	0	1	0	0	1	1	0	0	0	1	1	1	0	0
MW4M05U04T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U04T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U04T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5: Talking and writing about addition 3. MW4M05U05T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T02	1	0	1	0	1	0	1	0	0	1	1	0	0	0	1	1	1	0	0
MW4M05U05T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T09	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T10	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T11	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U05T12	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 6: Tracking progress and productivity. MW4M05U08T01	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U08T02	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M05U08T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U08T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M05U08T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 7: Methods of subtraction. MW4M05U07T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M05U07T02	1	0	1	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0
Module 6: Forms and photographs. Unit 1: Advertising boards. MW4M06U01T01	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M06U01T02	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M06U01T03	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M06U01T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 2: Aerial photographs. MW4M06U02T01	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
Unit 3: Triangles and border patterns. MW4M06U03T01	0	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M06U03T02	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M06U03T03	1	1	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M06U03T04	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M06U03T05	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M06U03T06	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M06U03T07	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M06U03T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M06U03T09	1	0	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
Unit 4: Ink devils and mirrors. MW4M06U04T01	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M06U04T02	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M06U04T03	1	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
MW4M06U04T04	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M06U04T05	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M06U04T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5: Symmetry in ethnic art. MW4M06U05T01	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Module 7: Shopping and saving. Unit 1: Shopping. MW4M07U01T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

	MW4M07U01T02	0	1	0	1	1	0	1	1	0	1	1	0	0	0	1	1	0	0	1
	MW4M07U01T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U01T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 2: Food prices.	MW4M07U02T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U02T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U02T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U02T04	0	1	0	1	1	0	1	0	1	1	1	0	1	0	1	1	1	0	1
Unit 3: Giving change correctly.	MW4M07U03T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U03T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U03T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U03T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U03T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U03T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U03T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U03T08	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
	MW4M07U03T09	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Unit 4: Buying sausages.	MW4M07U04T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U04T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U04T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5: Coins and notes.	MW4M07U05T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U05T02	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
	MW4M07U05T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M07U05T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Unit 6: Rands and cents. MW4M07U08T01	0	1	0	1	1	0	1	1	1	0	1	0	1	0	1	1	0	0	1
MW4M07U08T02	0	1	0	1	1	0	1	1	1	0	1	0	1	0	1	1	0	0	1
MW4M07U08T03	0	1	0	1	1	0	1	1	1	0	1	0	1	0	1	1	0	0	1
Unit 7: Change. MW4M07U07T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U07T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U07T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U07T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U07T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U07T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U07T07	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 8: Subtraction exercises. MW4M07U08T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U08T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U08T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U08T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U08T05	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M07U08T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U08T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U08T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U08T09	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 9: Savings. MW4M07U09T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U09T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U09T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U09T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M07U09T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 10: Business at the athletics meeting. MW4M07U10T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T07	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T08	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U10T09	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 11: Methods of subtraction 1. MW4M07U11T01	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0
MW4M07U11T02	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0
MW4M07U11T03	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0
MW4M07U11T04	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0
MW4M07U11T05	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0
MW4M07U11T06	1	0	1	0	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0
Unit 12: Methods of subtraction 2. MW4M07U12T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U12T02	1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
Unit 13: Methods of subtraction 3. MW4M07U13T01	1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
MW4M07U13T02	1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
MW4M07U13T03	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	0
Unit 14: Methods of subtraction 4. MW4M07U14T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U14T02	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0

MW4M07U14T03	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M07U14T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U14T05	1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
Unit 15: Subtraction exercise. MW4M07U15T01	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	0
MW4M07U15T02	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	1	1	0	0
MW4M07U15T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U15T04	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M07U15T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 16: The cinema. MW4M07U16T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U16T02	0	1	0	1	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1
MW4M07U16T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U16T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 17: Savings, rent and inheriting money. MW4M07U17T01	0	1	0	1	1	0	1	0	1	0	1	0	1	0	1	1	1	0	1
MW4M07U17T02	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M07U17T03	0	1	0	1	1	0	0	0	1	0	1	0	1	0	1	0	1	0	0
MW4M07U17T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U17T05	0	1	0	1	1	0	0	0	1	0	1	0	1	0	1	0	1	0	0
MW4M07U17T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U17T07	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U17T08	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U17T09	0	1	0	1	1	0	0	0	1	0	1	0	1	0	1	0	1	0	0
Unit 18: Savings. MW4M07U18T01	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U18T02	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M07U18T03	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U18T04	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U18T05	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 19: Tenths. MW4M07U19T01	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U19T02	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U19T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U19T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M07U19T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Module 8: Production and earning. Unit 1: Busy Melanie. MW4M08U01T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U01T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U01T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U01T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U01T05	0	1	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0
Unit 2: Lester's income. MW4M08U02T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T09	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T10	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M08U02T11	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T12	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T13	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M08U02T14	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U02T15	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 3: Using tables in the street market. MW4M08U03T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U03T02	0	1	0	1	1	0	1	0	1	1	0	1	0	0	1	1	1	0	1
MW4M08U03T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U03T04	1	0	1	0	1	0	1	0	0	1	1	0	0	0	1	1	1	0	0
MW4M08U03T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U03T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U03T07	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M08U03T08	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
Unit 4: More about using tables. MW4M08U04T01	1	0	1	0	1	0	1	0	0	1	1	0	0	0	1	1	1	0	0
MW4M08U04T02	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
MW4M08U04T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U04T04	1	0	1	0	1	0	1	0	0	1	1	0	0	0	1	1	1	0	0
MW4M08U04T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5:The end of a cattle farm. MW4M08U05T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Unit 6: Sharing bonuses. MW4M08U08T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U08T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U08T03	0	1	0	1	1	0	0	1	0	0	1	0	0	0	1	0	0	0	0
Unit 7: Compost for the vegetables. MW4M08U07T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U07T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 8: Sharing income. MW4M08U08T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U08T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 9: Clothes and colours. MW4M08U09T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U09T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U09T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 10: The dress factory. MW4M08U10T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U10T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U10T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U10T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U10T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U10T06	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U10T07	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U10T08	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M08U10T09	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 11: Supplying exercise books. MW4M08U11T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U11T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U11T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U11T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

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MW4M08U11T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U11T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U11T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 12: Easy multiplication. MW4M08U12T01	1	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0
MW4M08U12T02	1	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0
MW4M08U12T03	1	0	1	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0
Unit 13: Knowledge is strength. MW4M08U13T01	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
MW4M08U13T02	1	0	1	0	1	0	1	0	1	0	0	1	0	0	1	1	1	0	0
MW4M08U13T03	1	0	1	0	1	0	1	0	1	0	0	1	0	0	1	1	1	0	0
MW4M08U13T04	1	0	1	0	1	0	1	0	1	0	0	1	1	0	1	1	1	0	0
Unit 14: Test your knowledge. MW4M08U14T01	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
MW4M08U14T02	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
MW4M08U14T03	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
MW4M08U14T04	1	0	1	0	1	0	1	0	0	1	1	0	1	0	1	1	1	0	0
Unit 15: The sheep farm. MW4M08U15T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U15T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U15T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U15T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U15T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 16: Fencing posts are expensive. MW4M08U16T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U16T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 17: Multiplication facts. MW4M08U17T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U17T02	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0

MW4M08U17T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U17T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U17T05	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
MW4M08U17T06	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M08U17T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U17T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 18: Darts. MW4M08U18T01	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U18T02	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U18T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 19: Methods of multiplication 1. MW4M08U19T01	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
MW4M08U19T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U19T03	1	0	1	0	1	0	1	0	0	1	1	0	0	0	1	1	1	0	0
Unit 20: Methods of multiplication 2. MW4M08U05T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U05T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 21: Methods of multiplication 3. MW4M08U21T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M08U21T02	1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0
MW4M08U21T03	1	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0

MW4M08U21T04	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
MW4M08U21T05	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
Module 9: Measurement. Unit 1: Let's measure 1. MW4M09U01T01	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M09U01T02	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U01T03	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U01T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U01T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 2: Let's measure 2. MW4M09U02T01	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U02T02	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M09U02T03	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M09U02T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 3: Let's measure 3. MW4M09U03T01	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U03T02	1	0	1	1	1	0	1	1	1	0	1	0	1	0	1	1	0	0	0
MW4M09U03T03	1	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U03T04	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M09U03T05	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M09U03T06	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
Unit 4: Let's measure 4. MW4M09U04T01	1	1	0	1	1	0	1	0	1	0	0	1	0	0	1	1	1	0	1
MW4M09U04T02	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U04T03	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U04T04	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5: Let's measure 5. MW4M09U05T01	1	0	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M09U05T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M09U05T03	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U05T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 6: Metres, centimetres and millimetres. MW4M09U08T01	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T02	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T03	1	0	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 7: Cardboard boxes. MW4M09U07T01	1	0	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M09U07T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U07T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U07T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U07T05	1	0	1	0	1	0	1	0	1	1	1	0	1	0	1	1	1	0	0
Unit 8: Orange juice. MW4M09U08T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U08T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 9: Mass. MW4M09U09T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U09T02	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
MW4M09U09T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U09T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 10: Scales. MW4M09U10T01	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U10T02	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Unit 11: Relations between units. MW4M09U11T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T04	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T06	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T07	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T08	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T09	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M09U11T10	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Module 10: Timing and travelling. Unit 1: Some problems. MW4M10U01T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U01T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 2: Journey by air. MW4M10U02T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U02T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U02T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 3: What's the time? MW4M10U03T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U03T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U03T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U03T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 4: Reading a watch. MW4M10U04T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U04T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U04T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U04T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Unit 5: Flight: schedules.	MW4M10U05T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U05T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U05T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 6: On the road.	MW4M10U06T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U06T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U06T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U06T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U06T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 7: Travelling.	MW4M10U07T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U07T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U07T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U07T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 8: Leap years.	MW4M10U08T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U08T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U08T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U08T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U08T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 9: Birthdays.	MW4M10U09T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U09T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U09T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U09T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 10: The year 2003.	MW4M10U10T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
	MW4M10U10T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M10U10T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U10T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U10T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 11: A journey by sea. MW4M10U11T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U11T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U11T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U11T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U11T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 12: A trip to the game reserve. MW4M10U12T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U12T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U12T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U12T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 13: Buses and seats. MW4M10U13T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U13T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U13T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit I4: On time. MW4M10U14T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U14T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U14T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 15: Cost calculations. MW4M10U15T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U15T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M10U15T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 16: Travel costs. MW4M10U16T01	0	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
MW4M10U16T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Module 11: Mathematical investigations. Unit 1: Sums and products. MW4M11U01T01	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M11U01T02	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M11U01T03	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M11U01T04	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
Unit 2: Seats. MW4M11U02T01	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M11U02T02	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M11U02T03	1	0	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	1
Unit 3: Slices. MW4M11U03T01	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M11U03T02	1	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 4: Flow diagrams. MW4M11U04T01	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M11U04T02	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M11U04T03	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 5: Puzzles. MW4M11U05T01	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M11U05T02	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
Module 12: Building. Unit 1: Working and sharing. MW4M12U01T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U01T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U01T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U01T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U01T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 2: The brick factory. MW4M12U02T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U02T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U02T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U02T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

MW4M12U02T05	1	0	1	0	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 3: Tiles 1. MW4M12U03T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U03T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U03T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 4: Interesting products. MW4M12U04T01	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M12U04T02	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M12U04T03	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M12U04T04	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M12U04T05	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
MW4M12U04T06	1	0	1	0	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0
Unit 5: Rows. MW4M12U05T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U05T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U05T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U05T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 6: Tiles 2. MW4M12U06T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U06T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U06T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 7: Driveways. MW4M12U07T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U07T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U07T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 8: Curious driveways. MW4M12U08T01	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U08T02	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U08T03	0	1	1	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0

Unit 9: Wallpaper. MW4M12U09T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U09T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U09T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
Unit 10: Lorries. MW4M12U10T01	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U10T02	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U10T03	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U10T04	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
MW4M12U10T05	0	1	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0
(*n* =)	273	337	271	355	132	6	534	519	52	31	558	22	31	408	132	110	39	6	35
	47.6%	58.7%	47.2%	61.8%	23.0%	1.0%	93.0%	90.4%	9.1%	5.4%	97.2%	3.8%	5.4%	71.1%	23.0%	19.2%	6.8%	1.0%	6.1%
															wrt reflection:	83.3%	29.5%	4.5%	26.5%

Appendix 7

Categories of work and pleasure, Grade 1

	TASKS	MATHS	WORK																		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour
MW1T01	With my teacher [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T02	Feeding time [counting, 1-1 correspondence]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T03	Animals [counting]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T04	Playing [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T05	Girls and boys [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T06	More [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T07	Less [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T08	How long? [counting, measure]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T09	A long time, a short time [measure]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T10	Cars [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T11	Sweets [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T12	Hens [counting]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T13	Shapes [geometry]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T14	Heavy and light [mass]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T15	Feeding time again [counting]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T16	Sharing chocolate [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T17	Some more [counting on]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T18	Some less [counting back]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T19	Swimming [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T20	Your own stencil [geometry: plane figures]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T21	Baking [counting: grouping]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW1T22	Fruit [counting: grouping]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T23	More or less [counting on/back]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T24	The same [equality]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T25	Making equal [equations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T26	In the garden [counting on]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T27	Faisal's animals [counting: grouping, division]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T28	Eggs [counting: grouping, division]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T29	Biscuits [counting: grouping, division]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
MW1T30	Flow diagram [operators: addition]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T31	Half [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T32	Making new shapes [geometry: composite plane figures]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T33	Faisal's animals again [equations]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T34	Sharing bread [division, fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T35	Double [multiplication by 2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T36	Some more doubles [multiplication by 2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T37	Summer [multiplication]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T38	Winter [division, fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T39	Sharing chocolate again [division, fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T40	Getting to school [numerical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T41	Chickens [counting back, subtraction]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T42	More eggs [grouping, division]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T43	How long? How far? [measure: linear]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T44	More flow diagrams [operators: addition, doubling]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T45	Number patterns [sequences]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T46	More and less [equations: subtraction]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T47	Sita's birthday [counting on: addition]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T48	Money [numerical combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	MISCELLANEOUS					PLEASURE			WORK, FUN AND PIXLATION						MATHEMATICS, FUN AND PIXLATION			YOUTH LABOUR, FUN & PIXLATION			FUN AND/OR PIXLATION		MATHEMATICS & WORK	
Task #	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixlation	Tasks signifying work	Tasks signifying work & pixlation	Tasks signifying work & fun	Tasks signifying work, fun & pixlation	Tasks signifying work & pixlation but not fun	Tasks signifying work & fun but not pixlation	Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixlation	Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixlation	Tasks signifying either fun or pixlation	Tasks signifying fun and pixlation	Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW1T01	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T02	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T03	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T04	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T05	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T06	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T07	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T08	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T09	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T10	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T11	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T12	0	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW1T13	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T14	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T15	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T16	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T17	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T18	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T19	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T20	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW1T21	0	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW1T22	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T23	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T24	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T25	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T26	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW1T27	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T28	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T29	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW1T30	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW1T31	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW1T33	0	0	0	0	1	1	1	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1
MW1T34	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T35	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T36	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T37	0	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW1T38	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T39	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T40	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T41	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T42	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T43	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T44	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW1T45	0	1	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1	0	1	0
MW1T46	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1	0
MW1T47	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T48	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

		MATHS	WORK																		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour
MW1T49	Buns [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T50	Cats and cars [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T51	Counting money [grouping addition, multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T52	Saving cents [grouping addition, multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T53	Sharing worms [grouping division]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T54	Chocolate [grouping multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T55	Shopping [addition, subtraction, numerical combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
MW1T56	More shopping [subtraction]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
MW1T57	Flowers [division with remainder]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T58	Tables without legs [numerical relations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T59	Belinda s party [division multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T60	More tables without legs [numerical relations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T61	Finding shapes [geometry composite plane figures]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T62	Sharing chocolate again [division, fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T63	Naming parts [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T64	Hungry birds [numerical relations]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T65	Hungry cats [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T66	Birthdays [numerical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T67	How much cooldrink? [volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T68	Selling fruit [subtraction]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T69	Matchbox towers [volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T70	Cutting open [geometry nets]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T71	More sweets [division, combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T72	Sweets again [addition, subtraction]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T73	Number pyramids [addition]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T74	Carpets [area]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T75	Hungry rabbits [numerical relations]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW1T76	Boxes [volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T77	Riddles [numerical relations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T78	Oranges [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T79	The best buy [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
MW1T80	Fair and unfair [division]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	Number of tasks (of 80 tasks)	11	16	2	1	0	0	0	0	0	0	0	0	1	0	0	0	1	3	2	15
	Percentage (of 80 task)	13.8%	20.0%	2.5%	1.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%	1.3%	3.8%	2.5%	18.8%

	MISCELLANEOUS					PLEASURE			WORK, FUN AND PIXILATION						MATHEMATICS, FUN AND PIXILATION			YOUTH LABOUR, FUN & PIXILATION			FUN AND/OR PIXILATION		MATHEMATICS & WORK	
Task #	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixilation	Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work, fun & pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW1T49	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T50	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T51	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T52	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T53	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T54	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T55	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW1T56	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW1T57	0	0	0	0	1	1	1	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1
MW1T58	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	0
MW1T59	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T60	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW1T61	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW1T62	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T63	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW1T64	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T65	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T66	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T67	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T68	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T69	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T70	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T71	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T72	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW1T74	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T75	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW1T76	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW1T77	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	0
MW1T78	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW1T79	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW1T80	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	1
Number of tasks (of 80 tasks)	1	13	1	5	45	41	41	28	24	6	7	11	4	5	11	3	6	15	3	3	54	15	11	24
Percentage (of 80 task)	1.3%	16.3%	1.3%	6.3%	56.3%	51.3%	51.3%	35.0%	30.0%	7.5%	8.8%	13.8%	5.0%	6.3%	13.8%	3.8%	7.5%	18.8%	3.8%	3.8%	67.5%	18.8%	13.8%	30.0%
									wrt work	25.0%	29.2%	45.8%	16.7%	20.8%	wrt maths	27.3%	54.5%	wrt y labour	20.0%	20.0%				

Appendix 8

Categories of work and pleasure, Grade 2

Task #	Task title & [mathematical content]	MATHS: Mathematics	WORK: Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour
MW2T001	With my teacher [counting]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T002	I can count numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T003	Pots and dots [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T004	Tables without legs [numerical relations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T005	Sharing sweets [division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T006	Shoes [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T007	Selling fruit 1 [subtraction]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
MW2T008	Selling fruit 2 [addition]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
MW2T009	Selling fruit 3 [[subtraction]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T010	Your own stencil [geometry: composite plane figures]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T011	Packing fruit [division]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T012	Money 1 [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T013	Flow diagrams [operators: addition, subtraction]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T014	Sharing chocolate 1 [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T015	Sharing money [division, multiples]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T016	Double [multiplication: doubling]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T017	Measure [measure: linear]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T018	Making equal [equations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T019	Buying sweets [division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T020	More sweets [division, combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T021	Choosing fruit [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T022	Counting money [addition]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T023	Counting more money [numerical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T024	Making equal [equations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T025	At school [division: multiplication]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW2T026	In the classroom 1 [division, multiplication]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW2T027	In the classroom 2 [geometry: coordinates]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW2T028	Sharing chocolate 2 [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T029	Who gets more? [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T030	Giving names [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T031	Fair or unfair? [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T032	At the river 1 [division, multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T033	At the river 2 [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T034	Centimetres and metres [measure: linear]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T035	Measuring in centimetres [measure: linear]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T036	How big? (A class activity) [measure: linear]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T037	Metres [measure: perimeter, area]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T038	Hungry rabbits 1 [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T039	Hungry rabbits 2 [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T040	Hungry rabbits 3 [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T041	Wake up! [measure: temporal]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T042	Minutes and hours [measure: temporal]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T043	Baking [counting, grouping]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
MW2T044	How many? [multiplication]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T045	A short way of writing [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T046	A quick meal [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T047	Belinda's flapjacks [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T048	A cold evening [division, fractions, multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Task #	MISCELLANEOUS: Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	PLEASURE: Youth recreation	Fun	Pixilation	WORK, FUN AND PIXILATION: Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work & fun or pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	MATHEMATICS, FUN AND PIXILATION: Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	YOUTH LABOUR, FUN & PIXILATION: Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	FUN AND/OR PIXILATION: Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	MATHEMATICS & WORK: Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW2T001	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T002	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T003	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T004	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW2T005	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T006	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T007	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW2T008	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T009	0	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW2T010	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	0
MW2T011	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T012	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T013	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW2T014	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T015	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T016	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T017	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T018	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T019	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T020	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T021	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T022	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T023	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T024	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T025	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T026	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T027	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T028	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T029	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T030	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T031	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T032	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T033	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T034	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T035	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW2T036	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T037	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T038	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T039	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T040	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T041	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T042	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T043	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW2T044	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1
MW2T045	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T046	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T047	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1
MW2T048	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

TASKS		MATHS	WORK																		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour
MW2T049	Shapes [geometry: 3 dimensional objects]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T050	Paving [multiplication]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW2T051	Heavy and light [measure: mass]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T052	Grams and kilograms [measure: mass]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T053	Carpets [measure: area]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T054	More carpets [measure: perimeter, area]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T055	Getting fit [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T056	Soccer [division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T057	Rugby [division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T058	A sports day [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T059	Cutting open [geometry: nets]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T060	Number pyramids [addition]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T061	Getting to school 1 [numerical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T062	Even and uneven [numbers]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T063	Getting to school 2 [measure: linear]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T064	Cooldrink and water [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T065	Millilitres and litres [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T066	Lots of fruit [division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T067	Lots of milk [multiplication, volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T068	Multiples 1 [integral multiples]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T069	Building towers [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T070	Shells [geometry: shape]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T071	A day [measure: temporal]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T072	A hot day [division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T073	How long? [measure: temporal]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T074	How long again? [measure: temporal]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T075	Inside secrets [geometry: dissection]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T076	We need sleep [measure: temporal]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T077	Money 2 [currency]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T078	Saving money [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T079	Making toys to sell 1 [subtraction, multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T080	Making toys to sell 2 [subtraction, multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T081	Where to sell? [retailing]	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T082	A trip to the beach 1 [multiplication, division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T083	A trip to the beach 2 [multiplication, division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T084	Multiples 2 [multiples]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T085	Hot and cold [temperature]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T086	Too hot and too cold [temperature]	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T087	Making porridge [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T088	Secret numbers [numerical relations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T089	Marge's porridge [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T090	Kilometres [measure]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T091	On holiday 1 [measure: linear]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T092	On holiday 2 [measure, numerical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T093	Sandwiches for school [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW2T094	Sandwiches [numerical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T095	Some more towers [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T096	The best buy 1 [comparison: shopping]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

TASKS	MISCELLANEOUS					PLEASURE			WORK, FUN AND PIXILATION						MATHEMATICS, FUN AND PIXILATION			YOUTH LABOUR, FUN & PIXILATION			FUN AND/OR PIXILATION		MATHEMATICS & WORK	
Task #	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixilation	Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work & fun or pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW2T049	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T050	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW2T051	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T052	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T053	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T054	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T055	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T056	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T057	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T058	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T059	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T060	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW2T061	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T062	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW2T063	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW2T064	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T065	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T066	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1
MW2T067	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T068	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW2T069	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T070	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T071	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T072	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T073	0	0	1	0	0	1	1	0	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1
MW2T074	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T075	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T076	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T077	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T078	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW2T079	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T080	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T081	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T082	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T083	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T084	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW2T085	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T086	0	0	0	0	1	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW2T087	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW2T088	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW2T089	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW2T090	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T091	1	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW2T092	1	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW2T093	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW2T094	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW2T095	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW2T096	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1

TASKS		MATHS	WORK																			MISCELLANEOUS					PLEASURE		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixilation
MW2T097	The best buy 2 [comparison: shopping]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
MW2T098	Road signs 1 [measure: linear]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
MW2T099	Road signs 2 [geometrical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
MW2T100	100 is a special number [multiples]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
MW2T101	Free time [moral order]	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0
	Number of tasks (of 101 tasks)	9	3	5	3	0	1	0	0	0	0	0	4	0	0	0	0	6	4	11	19	2	12	6	12	30	41	41	45
	Percentage (of 101 task)	8.9%	3.0%	5.0%	3.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%	0.0%	0.0%	0.0%	0.0%	5.9%	4.0%	10.9%	18.8%	2.0%	11.9%	5.9%	11.9%	29.7%	40.6%	40.6%	44.6%

Task #	WORK, FUN AND PIXILATION: Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work & fun or pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	MATHEMATICS, FUN AND PIXILATION: Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	YOUTH LABOUR, FUN & PIXILATION: Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	FUN AND/OR PIXILATION: Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	MATHEMATICS & WORK: Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW2T097	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T098	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW2T099	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW2T100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW2T101	1	0	1	1	0	1	0	0	0	1	1	0	1	0	0	1
Number of tasks (of 101 tasks)	34	12	8	18	10	6	9	1	6	19	5	5	67	19	9	34
Percentage (of 101 task)	33.7%	11.9%	7.9%	17.9%	9.9%	5.9%	8.9%	1.0%	5.9%	18.8%	5.0%	5.0%	66.3%	18.8%	8.9%	33.7%
	wrt work	35.3%	23.5%	52.9%	29.4%	17.6%	wrt maths:	11.1%	66.7%	wrt y. labour:	26.3%	26.3%				

Appendix 9

Categories of work and pleasure, Grade 3

		MATHS	WORK																		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour
MW3T001	Onions! [factors]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T002	Untidy numbers [prime numbers]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T003	New learners [division]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW3T004	Lots of eggs [division]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T005	Money [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T006	At the post office [multiplication]	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
MW3T007	Peaches [multiplication, operators]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T008	Sharing chocolate [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T009	Sausages for all 1 [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T010	Bits and pieces1[fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T011	Your own stencil1[geometry: plane figures]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T012	Money for tuck 1 [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T013	Money for tuck 2 [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T014	Moosa's shop [numerical relations]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T015	More eggs [numerical relations]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T016	Tiling a surface 1 [tessellations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T017	What the bees know [tessellations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T018	Lots of money [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T019	Sausages for all 2 [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T020	Bags full of numbers [equations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T021	Apples and eggs [division]	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T022	Lots of stamps [multiplication]	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
MW3T023	Shopping at Moosa's [combinations]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
MW3T024	Number pyramids [addition]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T025	Working on Saturdays [division]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T026	Fingers, hands and feet [measure: length]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T027	Centimetres [measure: length]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T028	Metres [measure: length]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T029	Growing taller [measure: length]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T030	Holiday clothes [measure: length]	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T031	Mix and match [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T032	Fencing [measure: perimeter]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T033	Paving [measure: area, multiplication]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW3T034	The school concert [co-ordinates]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW3T035	The soccer season [measure: perimeter; numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T036	Looking down from above [geometry: orthogonal projections]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T037	More blocks [numerical relations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T038	Floor plans [geometry: orthogonal projections]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T039	Water problems [addition, division]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW3T040	Playing netball [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T041	A great big party! [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T042	Another great big party! [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T043	Ice cream [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T044	Toys out of wire [numerical relations]	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T045	Which would you rather have? [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T046	Hours and minutes [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T047	At the clinic [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
MW3T048	Good medicine [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

	MISCELLANEOUS					PLEASURE			WORK, FUN AND PIXILATION						MATHEMATICS, FUN AND PIXILATION			YOUTH LABOUR, FUN & PIXILATION			FUN AND/OR PIXILATION		MATHEMATICS & WORK	
Task #	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixilation	Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work & fun or pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW3T001	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T002	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T003	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T004	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T005	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T006	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T007	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T008	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T009	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T010	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T011	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1	0
MW3T012	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T013	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T014	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW3T015	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW3T016	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW3T017	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW3T018	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T019	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T020	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW3T021	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T022	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T023	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T024	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T025	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW3T026	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW3T027	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
MW3T028	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T029	0	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	1
MW3T030	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T031	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T032	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T033	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T034	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T035	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T036	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T037	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T038	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T039	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T040	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T041	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T042	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T043	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T044	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T045	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T046	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T047	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T048	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

TASKS		MATHS	WORK																			MISCELLANEOUS					PLEASURE		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixilation
MW3T049	More bits and pieces [fractions]	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T050	How long does it take? [measure: time]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
MW3T051	Different numbers, the same time [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
MW3T052	A year is a long time [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
MW3T053	Buying stamps [combinations]	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
MW3T054	Cakes and chocolate [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T055	How to make a water bomb [geometrical construction: 3D]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T056	Tiling a surface 2 [tessellations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T057	At the hardware shop [multiplication; addition]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T058	Chips and cooldrinks [statistical description]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T059	More bar charts [numerical description]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0
MW3T060	Going on a trip [multiplication: division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
MW3T061	At the fun fair [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
MW3T062	Sharing prize money [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
MW3T063	A class party [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1
MW3T064	How much longer? [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	0
MW3T065	Rugby matches [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1
MW3T066	Make a paper cup [geometrical construction: 3D]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T067	Bubble mix 1 [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T068	Bubble mix 2 [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
MW3T069	Busy times at the clinic [[statistical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
MW3T070	What is left? [odd numbers]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T071	Milk, cooldrink and water [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T072	Wasting money [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0
MW3T073	Litres and millilitres [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1
MW3T074	Painting! [measure: volume]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
MW3T075	How to make a pyramid [geometrical construction: 3D]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T076	Magic boxes [geometrical construction: 3D]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T077	How old are you? [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
MW3T078	Pascal's triangle [numerical relations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T079	Lots of paint [measure: volume]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T080	Leftover paint [measure: volume]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T081	More untidy numbers [prime numbers]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T082	I am heavier than you are [measure: mass]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
MW3T083	Kilograms [measure: mass]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
MW3T084	A school supper [measure: mass]	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T085	Loaded up [measure: mass]	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T086	Yummy leftovers [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
MW3T087	Is it true? [fractions]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
MW3T088	The tooth mouse and the tooth fairy [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
MW3T089	Chocolate cake [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T090	Mrs Sishuba's birthday [addition, multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	1
MW3T091	Sharing [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
MW3T092	Spending time [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0
MW3T093	Very tidy numbers [square integers]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T094	Baking biscuits [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T095	Cold things for hot days [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
MW3T096	Helping on the farm [numerical relations]	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0

Task #	WORK, FUN AND PIXILATION						MATHEMATICS, FUN AND PIXILATION			YOUTH LABOUR, FUN & PIXILATION			FUN AND/OR PIXILATION		MATHEMATICS & WORK	
	Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work & fun or pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW3T049	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T050	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T051	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T052	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T053	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T054	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T055	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T056	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T057	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T058	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T059	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T060	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T061	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T062	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T063	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T064	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T065	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T066	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T067	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T068	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T069	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T070	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T071	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T072	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T073	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T074	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T075	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T076	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T077	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T078	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T079	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T080	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T081	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T082	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T083	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T084	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T085	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T086	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T087	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T088	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T089	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T090	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T091	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T092	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T093	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T094	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T095	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T096	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1

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TASKS		MATHS	WORK																		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour
MW3T097	Making a profit [multiplication, subtraction]	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T098	A sports day — what to ask? [numerical description]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW3T099	Paths [circle and square]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T100	Centuries [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T101	To the cinema [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T102	Ordering stamps [multiplication]	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
MW3T103	Fillings for sandwiches [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
MW3T104	Posting parcels [measure: mass]	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
MW3T105	Posting letters [measure: mass]	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
MW3T106	A party at break [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T107	Twirling shapes [geometrical transformations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T108	Jelly! [measure: volume]	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T109	More jelly [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0
MW3T110	To market 1 [measure: mass]	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T111	To market 2 [measure: mass]	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T112	Choosing [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T113	Cooldrink for a picnic [measure: volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T114	Looking for shapes [tessellations]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T115	Mixing cooldrink [measure: mass and volume]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T116	New netball courts [measure: perimeter]	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
MW3T117	A whole day's sport [division]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T118	Paving slabs [measure: area]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T119	Wooden toys [measure: length]	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T120	120 is a special number [multiples]	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T121	A camping trip 1 [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T122	A camping trip 2 [fractions]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
MW3T123	More cooldrink mixing [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T124	Watching television [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T125	More television [measure: time]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T126	Pocket money [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
MW3T127	What shows? [geometrical construction: 3D]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T128	At the farm stall 1 [measure: time, multiplication]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T129	At the farm stall 2 [fractions]	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T130	Soccer [multiplication]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T131	A long way 1 [measure: length]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T132	A long way 2 [measure: length and time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T133	A long way 3 [measure: length and time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T134	The shortest way 1 [measure: length]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T135	The shortest way 2 [measure: length]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T136	The shortest way 3 [measure: length]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T137	Toffees [estimation]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T138	Drinking tea [numerical relations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
MW3T139	More toffees [multiplication]	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
MW3T140	Spring flowers [multiplication]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T141	The toffee factory [numerical relations]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T142	Packing toffees [measure: volume]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T143	I don't believe it! [measure: length]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T144	What do I get? [measure: mass]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	MISCELLANEOUS					PLEASURE			WORK, FUN AND PIXILATION						MATHEMATICS, FUN AND PIXILATION			YOUTH LABOUR, FUN & PIXILATION			FUN AND/OR PIXILATION		MATHEMATICS & WORK	
Task #	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixilation	Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work & fun or pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW3T097	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T098	0	0	0	0	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T099	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T100	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T101	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T102	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T103	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T104	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T105	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T106	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T107	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T108	0	0	0	0	0	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T109	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T110	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T111	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T112	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T113	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T114	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T115	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T116	0	0	0	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T117	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T118	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T119	0	0	1	0	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
MW3T121	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T122	1	0	0	0	0	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T123	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T124	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T125	0	0	1	1	0	1	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T126	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T127	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T128	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW3T129	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
MW3T130	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T131	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T132	1	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T133	1	0	1	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T134	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T135	1	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T136	1	0	0	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T137	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T138	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T139	0	0	0	0	0	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T140	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T141	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T142	0	0	0	0	0	0	1	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T143	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T144	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

TASKS		MATHS	WORK																			MISCELLANEOUS					PLEASURE		
Task #	Task title & [mathematical content]	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Pixilation
MW3T145	Different watches 1 [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1
MW3T146	Different watches 2 [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
MW3T147	Ordering for next year [multiplication]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
MW3T148	More orders [division]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
MW3T149	Window-shopping [subtraction]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0
MW3T150	A thousand is a big number! [measure: volume]	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
MW3T151	Cape Town to Pretoria 1 [measure: time]	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1
MW3T152	Cape Town to Pretoria 2 [measure: time]	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1
MW3T153	Going shopping [combinations]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
MW3T154	Chocolate sums [measure: volume]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
MW3T155	Another visit to George [measure: length]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1
MW3T156	Pretoria to Cape Town [measure: length]	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
MW3T157	Secrets inside [geometrical description]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
MW3T158	Going fishing [measure: mass, volume, length]	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T159	A sandwich puzzle [measure: mass]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
MW3T160	The holidays are coming [measure: time]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0
	Number of tasks (of 160 tasks)	15	19	10	13	5	3	0	0	6	1	0	7	22	0	5	0	9	1	12	7	9	3	27	35	9	61	76	68
	Percentage (of 160 task)	9.4%	11.8%	6.3%	8.1%	3.1%	1.9%	0.0%	0.0%	3.8%	0.6%	0.0%	4.4%	13.6%	0.0%	3.1%	0.0%	5.6%	0.6%	7.5%	4.8%	5.6%	1.8%	16.9%	21.8%	5.6%	38.1%	47.5%	42.5%

	WORK, FUN AND PIXILATION						MATHEMATICS, FUN AND PIXILATION			YOUTH LABOUR, FUN & PIXILATION			FUN AND/OR PIXILATION		MATHEMATICS & WORK	
Task #	Tasks signifying work	Tasks signifying work & pixilation	Tasks signifying work & fun	Tasks signifying work & fun or pixilation	Tasks signifying work & pixilation but not fun	Tasks signifying work & fun but not pixilation	Tasks signifying mathematics	Tasks signifying mathematics & fun	Tasks signifying mathematics & pixilation	Tasks signifying youth labour	Tasks signifying youth labour & fun	Tasks signifying youth labour & pixilation	Tasks signifying either fun or pixilation	Tasks signifying fun and pixilation	Tasks signifying mathematics but not work	Tasks signifying work but not mathematics
MW3T145	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T146	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T147	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T148	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T149	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
MW3T150	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	1
MW3T151	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T152	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T153	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T154	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1
MW3T155	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
MW3T156	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T157	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW3T158	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
MW3T159	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	1
MW3T160	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Number of tasks (of 160 tasks)	94	46	37	71	34	25	15	1	5	7	0	4	120	24	15	94
Percentage (of 160 task)	58.8%	28.8%	23.1%	44.4%	21.3%	15.6%	9.4%	0.6%	3.1%	4.4%	0.0%	2.5%	75.0%	15.0%	9.4%	58.8%
	wrt work	48.9%	39.4%	75.5%	36.2%	26.6%	wrt maths	6.7%	33.3%	wrt y. labour:	0.0%	57.1%				

Appendix 10

Categories of work and pleasure, Grade 4

Unit	MATHS	WORK																			MISCELLANEOUS					PLEASURE			WORK, FUN AND LUDIC						MATHEMATICS, FUN AND LUDIC			YOUTH LABOUR, FUN & LUDIC			FUN AND/OR LUDIC		MATHEMATICS & WORK	
	Mathematics	Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour	Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	Youth recreation	Fun	Ideal fun	Units signifying work	Units signifying work & ideal fun	Units signifying work & fun	Tasks signifying work & fun or ideal fun	Units signifying work & ideal fun but not fun	Units signifying work & fun but not ideal fun	Units signifying mathematics	Units signifying mathematics & fun	Units signifying mathematics & ideal fun	Units signifying youth labour	Units signifying youth labour & fun	Units signifying youth labour & ideal fun	Units signifying either fun or ideal fun	Units signifying fun and ideal fun	Units signifying mathematics but not work	Units signifying work but not mathematics
Module 1: Comparing houses. Unit 1: A new house for the Nhlapo family. MW4M01U01T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 2: Vusi and Felicity think again. MW4M01U02T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 3: Looking more carefully at the sizes of the two houses. MW4M01U03T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 4: Two new schools. MW4M01U04T01	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Module 2: Let's investigate. Unit 1: Chains and notes. MW4M02U01T01	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 2: Flow diagrams. MW4M02U02T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 3: Addition. MW4M02U03T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 4: Nine and ninety-nine. MW4M02U04T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 5: Handshakes. MW4M02U05T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Module 3: The Tendele Environment Project. Unit 1: Our trees. MW4M03U01T01	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 2: Working in the environment. MW4M03U02T01	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 3: More environment trips. MW4M03U03T01	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 4: Janet plans food supplies. MW4M03U04T01	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 5: Counting money. MW4M03U05T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 6: Number snakes. MW4M03U06T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 7: Counting in groups. MW4M03U07T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 8: Troubles during an environment trip. MW4M03U08T01	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	1	0	1	1	0	0	0
Module 4: Pieces of mathematical history. Unit 1: Measuring with a traditional unit. MW4M04U01T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 2: Measuring something in shinbs. MW4M04U02T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 3: Some number history. MW4M04U03T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Module 5: Keeping track. Unit 1: Number and data on an egg farm. MW4M05U01T01	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 2: The roadside stall. MW4M05U02T01	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 3: Talking and writing about addition 1. MW4M05U03T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 4: Talking and writing about addition 2. MW4M05U04T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 5: Talking and writing about addition 3. MW4M05U05T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 6: Tracking progress and productivity. MW4M05U06T01	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 7: Methods of subtraction. MW4M05U07T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Module 6: Forms and photographs. Unit 1: Advertising boards. MW4M06U01T01	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 2: Aerial photographs. MW4M06U02T01	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 3: Triangles and border patterns. MW4M06U03T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1
Unit 4: Ink devils and mirrors. MW4M06U04T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 5: Symmetry in ethnic art. MW4M06U05T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Module 7: Shopping and saving. Unit 1: Shopping. MW4M07U01T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 2: Food prices. MW4M07U02T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 3: Giving change correctly. MW4M07U03T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1
Unit 4: Buying sausages. MW4M07U04T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 5: Coins and notes. MW4M07U05T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 6: Rands and cents. MW4M07U06T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Unit 7: Change. MW4M07U07T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 8: Subtraction exercises. MW4M07U08T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 9: Savings. MW4M07U09T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0
Unit 10: Business at the athletics meeting. MW4M07U10T01	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0
Unit 11: Methods of subtraction 1. MW4M07U11T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 12: Methods of subtraction 2. MW4M07U12T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 13: Methods of subtraction 3. MW4M07U13T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 14: Methods of subtraction 4. MW4M07U14T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 15: Subtraction exercise. MW4M07U15T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 16: The cinema. MW4M07U16T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Unit 17: Savings, rent and inheriting money. MW4M07U17T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 18: Savings. MW4M07U18T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	0
Unit 19: Tenths. MW4M07U19T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Module 8: Production and earning. Unit 1: Busy Melanie. MW4M08U01T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	1	0	1	1	0	0	0
Unit 2: Lester's income. MW4M08U02T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	1	0	1	1	0	0	0
Unit 3: Using tables in the street market. MW4M08U03T01	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 4: More about using tables. MW4M08U04T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0

Unit	MATHS: Mathematics	WORK: Farming	Trading	Retail	Manufacturing	Transport	Generic adult work	Construction	Postal services	Fishing	DIY	School administration	Cottage industry	Environmental work	Health care	Community service	Travel	Shopping	Housekeeping	Youth labour
Unit 5 The end of a cattle farm MW4M08U05T01	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 6 Sharing bonuses MW4M08U06T01	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 7 Compost for the vegetables MW4M08U07T01	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 8 Sharing income MW4M08U08T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 9 Clothes and colours MW4M08U09T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 10 The dress factory MW4M08U10T01	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 11 Supplying exercise books MW4M08U11T01	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Unit 12 Easy multiplication MW4M08U12T01	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 13 Knowledge is strength MW4M08U13T01	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 14 Test your knowledge MW4M08U14T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 15 The sheep farm MW4M08U15T01	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 16 Fencing posts are expensive MW4M08U16T01	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 17 Multiplication facts MW4M08U17T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 18 Darts MW4M08U18T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 19 Methods of multiplication 1 MW4M08U19T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 20 Methods of multiplication 2 MW4M08U05T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 21 Methods of multiplication 3 MW4M08U21T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Module 9 Measurement Unit 1 Let's measure 1 MW4M09U01T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 2 Let's measure 2 MW4M09U02T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 3 Let's measure 3 MW4M09U03T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 4 Let's measure 4 MW4M09U04T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Unit 5 Let's measure 5 MW4M09U05T01	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Unit 6 Metres, centimetres and millimetres MW4M09U06T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 7 Cardboard boxes MW4M09U07T01	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 8 Orange juice MW4M09U08T01	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Unit 9 Mass MW4M09U09T01	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Unit 10 Scales MW4M09U10T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 11 Relations between units MW4M09U11T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Module 10 Timing and travelling Unit 1 Some problems MW4M10U01T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Unit 2 Journey by air MW4M10U02T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 3 What's the time? MW4M10U03T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 4 Reading a watch MW4M10U04T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 5 Flight schedules MW4M10U05T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 6 On the road MW4M10U06T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 7 Travelling MW4M10U07T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 8 Leap years MW4M10U08T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 9 Birthdays MW4M10U09T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 10 The year 2003 MW4M10U10T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 11 A journey by sea MW4M10U11T01	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 12 A trip to the game reserve MW4M10U12T01	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Unit 13 Buses and seats MW4M10U13T01	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit I4 On time MW4M10U14T01	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Unit 15 Cost calculations MW4M10U15T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 16 Travel costs MW4M10U16T01	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Module 11 Mathematical investigations Unit 1 Sums and products MW4M11U01T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 2 Seats MW4M11U02T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 3 Shoes MW4M11U03T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 4 Flow diagrams MW4M11U04T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 5 Puzzles MW4M11U05T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Module 12 Building Unit 1 Working and sharing MW4M12U01T01	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 2 The brick factory MW4M12U02T01	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 3 Tiles 1 MW4M12U03T01	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Unit 4 Interesting products MW4M12U04T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 5 Rows MW4M12U05T01	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 6 Tiles 2 MW4M12U06T01	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0

Unit	MISCELLANEOUS: Family activity	Objects (natural and/or manufactured)	Time	Money	Mathematising the body	PLEASURE: Youth recreation	Fun	Ideal fun	WORK, FUN AND LUDIC: Units signifying work	Units signifying work & ideal fun	Units signifying work & fun	Tasks signifying work & fun or ideal fun	Units signifying work & ideal fun but not fun	Units signifying work & fun but not ideal fun	MATHEMATICS, FUN AND LUDIC: Units signifying mathematics	Units signifying mathematics & fun	Units signifying mathematics & ideal fun	YOUTH LABOUR, FUN & LUDIC: Units signifying youth labour	Units signifying youth labour & fun	Units signifying youth labour & ideal fun	FUN AND/OR LUDIC: Units signifying either fun or ideal fun	Units signifying fun and ideal fun	MATHEMATICS & WORK: Units signifying mathematics but not work	Units signifying work but not mathematics
Unit 5 The end of a cattle farm MW4M08U05T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 6 Sharing bonuses MW4M08U06T01	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 7 Compost for the vegetables MW4M08U07T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 8 Sharing income MW4M08U08T01	0	0	1	1	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 9 Clothes and colours MW4M08U09T01	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Unit 10 The dress factory MW4M08U10T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 11 Supplying exercise books MW4M08U11T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 12 Easy multiplication MW4M08U12T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 13 Knowledge is strength MW4M08U13T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 14 Test your knowledge MW4M08U14T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 15 The sheep farm MW4M08U15T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 16 Fencing posts are expensive MW4M08U16T01	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 17 Multiplication facts MW4M08U17T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 18 Darts MW4M08U18T01	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1	0	0	0	1	1	1	1
Unit 19 Methods of multiplication 1 MW4M08U19T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 20 Methods of multiplication 2 MW4M08U05T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 21 Methods of multiplication 3 MW4M08U21T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Module 9 Measurement Unit 1 Let's measure 1 MW4M09U01T01	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 2 Let's measure 2 MW4M09U02T01	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 3 Let's measure 3 MW4M09U03T01	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 4 Let's measure 4 MW4M09U04T01	0	0	0	1	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 5 Let's measure 5 MW4M09U05T01	0	0	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 6 Metres, centimetres and millimetres MW4M09U06T01	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 7 Cardboard boxes MW4M09U07T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 8 Orange juice MW4M09U08T01	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0
Unit 9 Mass MW4M09U09T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 10 Scales MW4M09U10T01	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 11 Relations between units MW4M09U11T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Module 10 Timing and travelling Unit 1 Some problems MW4M10U01T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 2 Journey by air MW4M10U02T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 3 What's the time? MW4M10U03T01	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 4 Reading a watch MW4M10U04T01	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 5 Flight schedules MW4M10U05T01	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 6 On the road MW4M10U06T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 7 Travelling MW4M10U07T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 8 Leap years MW4M10U08T01	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 9 Birthdays MW4M10U09T01	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 10 The year 2003 MW4M10U10T01	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Unit 11 A journey by sea MW4M10U11T01	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 12 A trip to the game reserve MW4M10U12T01	0	0	0	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0
Unit 13 Buses and seats MW4M10U13T01	0	0	1	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit I4 On time MW4M10U14T01	0	0	1	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 15 Cost calculations MW4M10U15T01	0	0	0	1	0	1	1	1	1	1	1	1	0	0	1	1	1	0	0	0	1	1	0	0
Unit 16 Travel costs MW4M10U16T01	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Module 11 Mathematical investigations Unit 1 Sums and products MW4M11U01T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 2 Seats MW4M11U02T01	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Unit 3 Shoes MW4M11U03T01	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
Unit 4 Flow diagrams MW4M11U04T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 5 Puzzles MW4M11U05T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Module 12 Building Unit 1 Working and sharing MW4M12U01T01	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 2 The brick factory MW4M12U02T01	0	0	0	1	0	0	0	1	1	1	0	1	1	0	1	0	1	0	0	0	1	0	0	0
Unit 3 Tiles 1 MW4M12U03T01	0	0	0	1	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 4 Interesting products MW4M12U04T01	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	1	0
Unit 5 Rows MW4M12U05T01	0	0	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 6 Tiles 2 MW4M12U06T01	0	1	0	0	0	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0

Unit	MATHS: Mathematics	WORK: Farming	WORK: Trading	WORK: Retail	WORK: Manufacturing	WORK: Transport	WORK: Generic adult work	WORK: Construction	WORK: Postal services	WORK: Fishing	WORK: DIY	WORK: School administration	WORK: Cottage industry	WORK: Environmental work	WORK: Health care	WORK: Community service	WORK: Travel	WORK: Shopping	WORK: Housekeeping	WORK: Youth labour	MISCELLANEOUS: Family activity	MISCELLANEOUS: Objects (natural and/or manufactured)	MISCELLANEOUS: Time	MISCELLANEOUS: Money	MISCELLANEOUS: Mathematising the body	PLEASURE: Youth recreation	PLEASURE: Fun	PLEASURE: Ideal fun
Unit 7: Driveways MW4M12U07T01	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Unit 8: Curious driveways MW4M12U08T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Unit 9: Wallpaper MW4M12U09T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1
Unit 10: Lorries MW4M12U10T01	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Number of units (of 114 units)	54	8	4	3	5	6	1	2	0	0	1	6	1	6	0	7	10	8	6	4	4	8	11	28	5	13	14	112
Percentage (of 114 units)	47.4%	7.0%	3.5%	2.6%	4.4%	5.3%	0.9%	1.8%	0.0%	0.0%	0.9%	5.3%	0.9%	5.3%	0.0%	6.1%	8.8%	7.0%	5.3%	3.5%	3.5%	7.0%	9.6%	24.6%	4.4%	11.4%	12.3%	98.2%

Unit	WORK, FUN AND LUDIC: Units signifying work	WORK, FUN AND LUDIC: Units signifying work & ideal fun	WORK, FUN AND LUDIC: Units signifying work & fun	WORK, FUN AND LUDIC: Tasks signifying work & fun or ideal fun	WORK, FUN AND LUDIC: Units signifying work & ideal fun but not fun	WORK, FUN AND LUDIC: Units signifying work & fun but not ideal fun	MATHEMATICS, FUN AND LUDIC: Units signifying mathematics	MATHEMATICS, FUN AND LUDIC: Units signifying mathematics & fun	MATHEMATICS, FUN AND LUDIC: Units signifying mathematics & ideal fun	YOUTH LABOUR, FUN & LUDIC: Units signifying youth labour	YOUTH LABOUR, FUN & LUDIC: Units signifying youth labour & fun	YOUTH LABOUR, FUN & LUDIC: Units signifying youth labour & ideal fun	FUN AND/OR LUDIC: Units signifying either fun or ideal fun	FUN AND/OR LUDIC: Units signifying fun and ideal fun	MATHEMATICS & WORK: Units signifying mathematics but not work	MATHEMATICS & WORK: Units signifying work but not mathematics
Unit 7: Driveways MW4M12U07T01	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 8: Curious driveways MW4M12U08T01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unit 9: Wallpaper MW4M12U09T01	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Unit 10: Lorries MW4M12U10T01	1	1	0	1	1	0	0	0	0	0	0	0	1	0	0	0
Number of units (of 114 units)	56	55	5	55	50	0	54	4	54	4	0	4	112	14	39	3
Percentage (of 114 units)	49.1%	48.2%	4.4%	48.2%	43.9%	0.0%	47.4%	3.5%	47.4%	3.5%	0.0%	3.5%	98.2%	12.3%	34.2%	2.6%
	wrt work	98.2%	8.9%	98.2%	89.3%	0.0%	wrt maths:	7.4%	100.0%	wrt youth labour	0.0%	100.0%				