

AN INVESTIGATION INTO
CHILDRENS' GRASP OF REALITY

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ABSTRACT

This study aims to explore a heterogeneous group of pre-schoolers' conceptual understanding. Seven Piagetian type tasks, aimed slightly above pre-schoolers' perceived pre-operational level of development, are presented to the research subjects individually, on two separate occasions. The results indicate that unilingual subjects fare best, while subjects learning a second language at the pre-school phase fare better than subjects who learn a second language at an earlier age. The results suggest that language alone is not predictive of task performance; higher parent education levels are associated with greater quantity and quality of mediated learning and with better task performances. The study concludes that task performance reflects the interaction between developmental level and learning opportunities, and the influence that factors such as age, language, class, parent education level and gender have on one this.

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SECTION 1. PROBLEM STATEMENT

1.1 Introduction to the problem

The impact of recent political changes in South Africa on education means that educators are faced with a heterogeneous group of learners, i.e. differences in terms of age, language, class, culture, ethnic group, parent educational level and gender. This is typical of many classroom situations. This heterogeneity is exactly what apartheid education prohibited by constructing the idea of group identities to separate people. South African common sense, at least of the more recent past, perceives too many differences as impacting negatively on learning-teaching effectiveness. Thus, related to the concept of heterogeneity, is the intuition that heterogeneous classrooms present complex problems. The importance of acknowledging differences is indicated by the inextricable link between this and how one thinks (Lucariello, 1995). In terms of cultural differences for example, Gauvain (1995) says that:

human beings engage in meaningful, goal-directed activities that reflect the goals and values of their culture.

The interesting research question raised, is whether an empirical investigation into heterogeneity will bear out the above idea. The importance of assessing conceptual processes (i.e. grasp of reality) at the pre-school level can not be over-estimated, as learning and understanding there, forms the foundation upon which all further skills must be developed.

The children in this study refer to a “heterogeneous” group of twenty four pre-school pupils. Their ages range between six years two months to five years five months (as at 1 August, 1997). These pre-school children are at the pre-operational stage of development in Piagetian terms. This implies that they are unable to perform certain mental operations; that they have no conservation, i. e. they do not understand that the properties of something remain unaltered, despite superficial changes in appearance; nor subdivision conceptualisation and are incapable of transductive thinking, i.e. the belief that things are associated because of their proximity to one another; they are unable to use juxtaposition, i.e. they tend to collect parts of information without being able to correctly relate them into a whole; there is evidence of centration i.e. they fixate on one aspect of a relationship; and static representation i.e. they are unable to manipulate mental representations, so as to realize that different arrangements of the same things still comprise the same constituents. They are egocentric in their thinking and therefore have difficulty in perceiving others’ perspectives. These factors need to be kept in mind when assessing subjects’ grasp of reality.

How different children grasp reality will depend on the developmental stage a child has reached, but also on how current experiences relate to previous experiences, i.e. how familiar things are in the sense of having had similar experiences previously. One would therefore expect experiences to be affected by age, home

language, class, parent education level and gender. The differing life experiences as an effect of the variation among the research subjects on these factors, is what is meant by heterogeneity in this study.

Given that the current educational system in South Africa is based on westernized, middle class values, the implications of a complex multi-cultural classroom is that children whose backgrounds do not reflect such experiences and values, will be at a disadvantage when taught from the dominant educational perspective. By “disadvantaged”, I refer to the fact that children from backgrounds other than westernised and middle class, lack appropriate educational experience at home. The concept of “disadvantage” is a relative one. It is dependent upon what the home background equips the child with and the knowledge and values that schools privilege.

By “teaching”, I refer to that activity described in Feuerstein’s mediated learning experience (M.L.E.) (Feuerstein, 1980). Mediation is the connecting factor between the child’s independent problem solving and her unfolding potential as determined through expertly guided problem solving experiences (Wertsch, 1985). In this research, the expert guidance takes the form of teacher interventions during the children’s execution of specific problem solving tasks.

The vision for the new South Africa specifically supports heterogeneity. Thus, the aim of this dissertation will be to look at the impact that teaching has on children's grasp of reality in the heterogeneous classroom situation. More specifically, i) how does heterogeneity manifest itself in the learning-teaching situation; and ii) what, if any, problem does this pose for education. In order to realize this aim, a baseline of children's performance on tasks will be gained in order to compare this to their later assisted or "taught" performances. If the taught performances show a different pattern to the baseline performance, it will be important to examine the nature of this difference. The nature of any differences will be analysed according to five factors: age, language, class, parent education level and gender.

1.2. Evidence

Initially, a pilot study was undertaken. Classification tasks were chosen, as classification is perceived as fundamental to more advanced skills, such as visual sequencing, which in turn influence the ability to discriminate between different letters and to sequence them for writing words. The results of classification tasks indicated differences across class.

The research aims to gain evidence about how heterogeneity manifests itself in the learning-teaching situation. Heterogeneity in terms of differing levels of the factors age, language, class, parent education level and gender are apparent, but how these

impact on the learning-teaching situation needs to be investigated. In the first task performance assessments, the aim is to establish whether and how the above-mentioned differences between the research subjects are reflected by task performance. The second task performance assessments, in contrast, aims to gain evidence about the possibly different effects of teaching on task performance, given the initial differences between the research subjects in terms of age, language, class, parent education level and gender.

1.3. Conclusion

The recent political, and concomitant educational, changes in South Africa mean that educators are faced with a more heterogeneous class. Common sense would dictate that such heterogeneity would present educators with perhaps too big a challenge. Thus, an investigation into heterogeneity promises to throw some light on common sense prejudices, which are too often unexamined and merely taken for granted (cf. Geertz, 1983 for an analysis of common sense).

SECTION 2. THEORETICAL FRAMEWORK

2.1. Introduction

Children's problem solving ability, that is, how they understand the world they experience, may be conceptualised as being attributable to learning, development, or to an interaction between these alternatives. In order to untangle the relative contribution of each of these to children's problem solving as displayed on task performance, a great deal of both empirical and theoretical work has been and will continue to be done. The research of Vygotsky and Piaget form the core of the theoretical section of this dissertation. Both work from a constructivist perspective, Vygotsky focusing on the social construction of knowledge and Piaget focusing on the individuals' active role in their development. Subsequent theories reflect an attempt to explicate how an interaction between learning and development work. Performance on tasks, whether attributable to learning, development or the interaction of these, may vary according to factors such as age, language, class parent education level or gender.

2.2. Vygotsky and learning

Vygotsky's work focuses on the "learning" aspect of cognitive change. In this regard, he gives priority to learning, which he regards as the internalisation of social communication. This internalisation of meaning allows for children's

independent problem solving to be elevated to a higher cognitive level by the expert guidance of, for example, a teacher. Vygotsky emphasises the effects of socio-historical constraints on the actual development of individuals and the potential for mediation. Socio-historical contexts vary according to place and evolve over time, providing unique circumstances in which individuals learn. In order to understand specific aspects of learning, Vygotsky believes it necessary to look first at the origins and transitions that mental functioning has undergone (Wertsch, 1993). In this regard, his genetic analysis of mental functioning considers changes in types of mental development. More specifically, this will indicate transitions from the phylogenetic to the socio-cultural domain and from the latter to the microgenetic changes characteristic in ontogenesis¹.

2.2.1. Types of mental functioning:

i) The phylogenetic domain

Vygotsky starts from a phylogenetic consideration of tool use: elementary (i.e. technical tools) in apes as opposed to the higher mental functioning of humans (i.e. psychological tools and signs, such as language or mathematics). Vygotsky defines a sign (“psychological tool”) as “a means of psychologically influencing behaviour” (Wertsch, 1993, p.120). He says that apes’ use of tools limits their action to the immediate context; in contrast, people are able to guide their problem solving

¹The phylogenetic domain refers to evolutionary changes in a species, whereas ontogenesis refers to characteristic developmental changes within individuals.

actions with the aid of linguistic tools, which are not reliant upon what is immediately available in the environment. This linguistic ability greatly expands the range and sophistication of problem solving potential. The use of technical tools by apes is regarded as a necessary, but not sufficient explanation for the evolution of higher mental functioning. The exact mechanism of transition to the socio-cultural domain is not stipulated in Vygotsky's work.

ii) The socio-cultural domain

The socio-cultural domain refers to a higher level of mental functioning. Thinking in this domain is categorised according to whether it is rudimentary or advanced. Vygotsky's work focuses on the advanced form of thinking, particularly as it emerges in the context of schooled literacy, with the latter's reliance on decontextualised semiotic means mediating communication and thinking².

iii) The ontogenetic domain

The ontogenetic domain considers how cultural development starts to interact with biological development. Biological development, in Vygotsky's ontogenetic level of analysis, operates in isolation in early childhood, but is soon integrated in a line of emergent interactionism: cultural development (i.e. the mastery of mediational means, via language) is superimposed on the natural, biological line of

²Decontextualised semiotic means refers to when words stand in place of their referents, so that objects not present in the immediate context can be communicated between people.

development. Vygotsky's focus on learning derives from the belief that after birth, biology is not enough to account for cognitive changes, but that socio-cultural influences then take precedence. (Bruner, Olver & Greenfield, 1967, Santrock, 1997; Wertsch, 1993). The above overview of how mental functioning develops, provides a backdrop for understanding more specific aspects of learning, such as mediation, for example.

2.2.2. Mediation

Mediated learning experiences refer to how the adult organises stimuli for children.

Feuerstein gives a descriptive account of the process of mediation. Thus:

by mediated learning experience (M.L.E.) were referred to the way in which stimuli emitted by the environment are transformed by the "mediating" agent, usually a parent, sibling or other caregiver. This mediating agent, guided by his intentions, culture, and emotional investment selects and organises the world of stimuli for the child.

The mediator selects stimuli that are most appropriate and then frames, filters, and schedules them; he determines the disappearance of certain stimuli and ignores others (quoted in Craig, 1985).

The intentional nature of mediation is clearly reflected in the above quotation.

This is important as Vygotsky's general genetic law of cultural development explains how the internalisation of mediated learning experience occurs:

internalisation transforms the thinking process itself and changes its structure and functions.

Thus, all higher mental functioning is seen to have its genesis in social interactions (Wertsch, 1993). The development of higher mental functioning explains Vygotsky's notion of "object in society". That is, the child learns to think according to the influence of the surrounding context. This is in opposition to Piaget's idea of "object in action", where the child initiates actions on the surrounding environment (Craig, 1985).

Mediation is particularly relevant in initial/early experiences, for example, the mother's or more capable peers' externally imposed guidance is internalised by the child over time, who subsequently develops cognitive controls for self-regulated behaviours (Wood, 1988). The quality of the mediated learning experience determines the cognitive structures of the child. These can then be further modified through direct experiences of stimuli. Quantity and timing (i.e. of early experiences) of mediated learning are associated with greater capacity for dealing with direct experiences. In contrast, a lack of mediated learning experiences explain deficient cognitive functions³. The importance of mediated learning is reiterated in findings indicating that young children do not spontaneously mediate

³"Deficient" refers to the underlying mental functions, not mental content. It therefore explains differential cognitive development.

their own actions, that is, they do not use learning strategies to aid mental functioning, unless prompted to do so (Wertsch, 1993).

According to Feuerstein (quoted in Wertsch, 1985), the culturally deprived child does not internalise problems as they occur, but uses a “hit and miss” approach in dealing with them. This means that no insightful behavioural schema (internal mental representation) is available when a similar situation recurs. Culturally deprived children lack sets of meaningful schema in their conceptual repertoire⁴.

2.2.3. The zone of proximal development

According to the Vygotskian paradigm, mediation is the connecting factor between the child’s independent problem solving and her unfolding potential, as determined through expertly guided problem solving experiences. The distance between the independent and guided problem solving creates the zone of proximal development (ZPD). Vygotsky (1978, pp.86-87, in Thomas, 1992) explains it as follows:

The zone of proximal development defines those functions that have not yet matured but are in the process of maturation, functions that will mature tomorrow but are currently in an embryonic state. These functions could be termed the “buds” or “flowers” of development rather than the “fruits” of development. The actual development level characterises mental

⁴ “Culturally deprived” refers to children who are deprived of learning their own culture, because their parents fail to mediate.

development retrospectively, while the zone of proximal development characterises mental development prospectively.

The ZPD can also be conceptualised as higher mental functioning involving two people thinking together to solve a problem (Wertsch, 1993).

2.2.4. The mechanics of the ZPD.

Wertsch (1985) sets out to unpack the mechanics of the ZPD. He uses three interrelated concepts to explain situation definition, intersubjectivity and semiotic mediation.

(1) Situation definition: As in Piaget's theory (see later), people are seen as active agents in defining situations. In Vygotsky's ZPD, this is important, as it highlights the fact that children and their mediating adults each have unique representations of a situation. As Moscovici (in Wertsch, 1985 p.12) says:

la realite dans laquelle nous vivons... peut avoir des significations multiples, existant cote a cote.

i.e. the reality in which we live ... may have multiple meanings, existing side by side (my translation). In order for the child and mediating agent to work successfully together, a comparative view needs to be established, or more precisely, the child gives up her view and makes a qualitative shift in understanding. This is achieved through communication. Children try to adjust what they say and how they

understand, according to their perceived comprehension of others, but this alone is not sufficient to ensure mutual understanding.

2) Intersubjectivity : In order to share the same situation definition, the adult must also “shift” temporarily in the sense that the presentation of her reality must be done in such away that it is amenable to the child’s level of thinking. A subject is brought into focus by one participant and jointly attended to by both of them.

Again, this is done through communication. The adult’s speech foregrounds aspects of the environment for the child’s attention (Wertsch, 1993). Leont’ev and Luria (Wertsch, 1985) argue that even at an early age, mental processes are being formed under the influence of verbal social interaction with surrounding adults. Trevarthen and Habley (1978 in Wertsch, 1985) state that the deliberate, self-conscious and reciprocal sharing of focus starts from children of nine months of age.

(3) Semiotic mediation: This implies that a particular way of talking about objects and events in a setting automatically sets the level at which intersubjectivity is to be established. Rommetveit (Wertsch, 1985) talks about the speaker’s privilege and the listener’s commitment. It is in this sense that speech can create, rather than merely reflect, an intersubjective situation definition. Semiotic mediation enables the establishment of intersubjectivity, which in turn leads to the definition (or redefinition) of the situation. The interrelatedness of situation definition, intersubjectivity and semiotic mediation indicate how knowledge is gained in a

social setting, where the child gains insight through social interactions with more advanced tutors.

2.2.5. The central role of language in mediated learning

The importance of social interactions for knowledge acquisition underlines the central role of language for learning. Vygotsky sees language as the product of socio-cultural evolution. He says:

A sign is always originally a means used for social purposes, a means of influencing others, and only later becomes a means of influencing oneself' (Wertsch, 1985, pp.80,81).

Vygotsky viewed the introduction of a psychological tool (i.e. language) into a mental function (eg. memory) as causing a fundamental transformation of that function. Language allows the child to go beyond the immediate situation, as it allows her to generate novel meanings (Bruner, 1997). Learning to make use of the cultural tool of language requires the child to make the leap from action (e.g. imitating a finger rhyme) to symbol, by herself, spontaneously abstracting the gesture from the specific context modelled by the parent/teacher and generalising it to other exemplars (i.e. initiating gestures to represent objects) (Acredolo & Goodman, 1997).

Not only Vygotsky, but also Bakhtin, focuses on ways in which language and other semiotic systems could be used to produce meaning, especially meaning as it

shapes human action. Bakhtin's (Wertsch, 1993) research expands on Vygotsky's intermental focus (i.e. the mediation between a child and a mediator). Bakhtin explains that semiotic mediation connects individual mental functioning to the historical, cultural and institutional aspects of the contexts in which it is situated (Wertsch, 1993, p.67). Vygotsky's unit of analysis of mediational means is word meaning; Bakhtin's unit of analysis is the utterance, as it is spoken in a particular socio-cultural context. He links utterance to the historical, cultural and institutional setting in which it occurs by his notion of social languages and speech genres. Utterances always involve the use of one or more social languages and speech genres. Social languages refer to how utterances are shaped by a particular stratum of society at a given time, for example: a military milieu evokes a different use of language to that of a medical milieu. Speech genres refer to typical types of utterance in a particular situation. They are thus closely associated with social languages.

Bakhtin says that any utterance is dialogical in nature: that is, two voices are apparent. An utterance reflects not only the speaker's unique voice (perspective), but also the addressee. Bakhtin continues to expand on Vygotsky's notion that meaning is always based on group life. Bakhtin regards any utterance as "a link in the chain of speech communication" (Wertsch, 1993, p.85). He rejects the image of a disengaged self. He says that the individual is constituted from the language and culture of her community and can not act independently of these influences

(Taylor, 1985 in Wertsch, 1993). The individual's words are not her own invention, but are necessarily selected from social languages available in the socio-cultural context. The individual personalises these words with her own intentions. Intramental (i.e. the individual's thoughts) or "hidden" dialogicality is called "ventriloquation". An example of this phenomenon would be when a young child guides her own behaviour by verbalising aloud values derived from her parents. This example clarifies what Vygotsky means by saying that even on the intramental plane, mental functioning retains a quasi-social nature.

Lotman (Wertsch, 1993) recognises that texts have an univocal and a dialogic function. The univocal function concerns the transmission of information from person "A" to person "B". The dialogic function generates new meaning. The dialogic function is achieved when the speaker is influenced by and modifies future utterances according to what has been previously said by another and by the reaction she anticipates from the listener. This influence similarly applies to the person(s) being addressed. This influencing of one another's utterances explains Bakhtin's term "interanimate". The univocal and dialogic functions may occur simultaneously, but one function tends to predominate, according to the particular context.

Closely associated with the notion of text function, is Bakhtin's concept of text authority. An authoritative discourse conveys fixed meanings. It is univocal and

discourages contact from external influences (i.e. other voices). Although two voices still influence one another in such cases, one person changes her thinking and speech more in relation to the response of the other, for example, a child in response to her teacher increasingly incorporates the teacher's meanings into her own. The authoritative voice is not necessarily indicated by the imperative, but always serves to regulate utterances in order that they can be grasped and internalised by others. The authoritative voice functions to assist the transition from intermental to intramental functioning. Children learn to master the scientific speech patterns of education even in the first years of schooling.

Bakhtin builds on Vygotsky's work, making the connection between individual and socio-cultural thinking through semiotic mediation more explicit; Wertsch (1993) expands on Vygotsky's notion of mediational means. In his "tool kit" analogy, Wertsch (1993) says that people chose between an array of different mediational means. Tulviste (1986 in Wertsch, 1993, p.96) refers to the qualitatively different forms of representing and acting on the world that these different forms of verbal thinking permit. Such heterogeneity is conceived of in several different ways, but all views agree that different "tools" are more appropriate for different activities, though the choice of mediational means is often used with little or no conscious reflection. The choice made will differ according to a particular situation. Bellah et al (1985 in Wertsch, 1993) refer to the choice made as "privileging" one social language over another in a particular setting. More specifically, choices will be

made according to the different historical, cultural and institutional aspects of the contexts of individuals or groups. This means that different groups (eg. class) may employ similar “tools” in different ways.

2.2.6. The influence of class, ethnicity and parent education level on mediation

Voloshinov (Wertsch, 1985, p.12) says:

The sign (eg. language) and its situation are inextricably fused.

Wertsch (1993) claims that “the person acting with mediational means” is an irreducible unit for understanding the generation of meaning. In this regard, Bernstein (Havighurst, 1976) has shown how the social status of a family (i.e. class) affects the child’s language development. In tandem with Vygotsky’s idea that verbal communication is imperative for cognitive development, Bernstein’s finding has important implications for explaining possible differences in children’s grasp of reality, as well as suggesting a direction for teaching children from different classes. In the South African context, the middle class has been the elite minority, indicating the challenge that class heterogeneity presents to educators.

More specifically, Bernstein’s theory (Wood, 1988, p.7) states that:

differences in the average levels of academic achievement attained by children from different home backgrounds could be understood and explained in terms of the ways in which language is used and structured in different social groups. Children from diverse social groups learn how to

use and understand language in different ways. Such linguistic differences affect adjustment to, communication in, and learning at, school.

He suggests that children from higher classes are likely to use an elaborated code of English, whereas working class children are likely to use a restricted code. This does not imply a superior grasp of English, except in the sense of compatibility with the school system. The elaborated code refers to a way of communicating which does not depend on the listener sharing the speaker's context in order to understand what is being said. The elaborate code is the language of the schools, which implies that middle class children are linguistically more prepared and thus more likely to find learning easier in such a milieu than are their working class counterparts. Bernstein's two codes of speaking the same language, contrast with Bakhtin's multiplicity of speech genres.

Context is an important factor in research emphasizing the contribution of learning to children's understanding of their world. Bruner's theory (Wood, 1988, p.84) says that:

effective teaching in school exposes children to ways of thinking that characterise different disciplines, which have developed to achieve certain ways of making sense of and understanding the world. If we accept such views on the nature of what it is that children learn when they are involved in both informal and formal instructional encounters, then we would expect

to find important, far-reaching differences in the way the children from different cultures, sub-cultures and social groups develop and learn.

Havighurst (1976) points out that cognitive development is associated with the child rearing practices of cultural subgroups in modern societies. Class is an important contributing factor to cognitive development, but ethnicity, especially in the lower working class, is also emphasised. Class is defined as a set of behaviours and attitudes that separate one social group from another. Ethnic groups consist of groups of people who have a real or imagined common past history and generally share a language, religion or a racial identity. Each ethnic group is a subculture with its own behaviours and attitudes. One class may comprise a variety of ethnic groups; and a particular ethnic group may be spread across different classes. In most cases, ethnic attitude towards education shows less differentiation in middle, as opposed to lower classes, where poverty is found to be associated with low levels of educational and occupational aspiration (Lewis, 1966 in Havighurst, 1976).

As mentioned before (see p. 1) in the South African context of the recent past, apartheid constructed the idea of group identities to discriminate between people: education standards varied accordingly. (Moulder in Young & Schlebusch, 1995). Levenstein (1988) emphasises that it is not poverty alone, but its concomitants, low parental motivation and a lack of parent education, more specifically, a lack of

graduation from high school, that leads to being disadvantaged at school. Bee (1981) refers to findings indicating that the better educated a child's parents are, the higher that child's I.Q. is likely to be, from as early as three years of age. Moreno (1991) argues that ethnicity rather than maternal educational level accounts for different mediational approaches used with children. Macdonald and Burroughs (1991) refute this, saying that children cope better if their parents have had a formal education, regardless of their ethnic origins.

From the above, it is evident that the interacting elements of the learning situation should be considered together. These involve environmental stimuli, the mediating agent, culture, and the child. Environmental stimuli may vary as a function of class and, one would anticipate, associated parent education level. Children from lower classes are likely to be presented with less variety of stimuli, as parents may be unable to afford both a range of materials and the time to present these to their children. Similarly, parents from the lower classes may be more concerned with their young child's physical well-being as less parent education might mean a lack of awareness of the importance of early cognitive mediation (Feuerstein in Wertsch, 1985). Thus, one would assume that learning performance would reflect the interplay between these elements and would anticipate differences in children as a result of the differences between the learning experiences they have had prior to the pre-school experience.

Feuerstein (Wertsch, 1985) says that the poor performance of many children from the lower classes is associated with a lack of consistent mediated learning in their early developmental histories, for example, because of parental ignorance and because Socratic dialogue games are characteristic of the middle class style.

Martini (1995) says that middle class parenting practices reflect a coherent set of cultural beliefs about their responsibility towards initiating their children into the group, which corresponds to the school's expectations. Thus, middle class children are already well prepared for the typical mediated learning activities of school (practice effects).

Apart from a lack of appropriate resources, a limited parent education level and a corresponding lack of mediated learning experiences, it has been found that conventional static test scores under-estimate the ability of children from the lower class. Such tests do not reflect optimal level of performance. Interactions between tester and testee benefit the middle class child by means of the tester's biased expectations. Teachers tend to give less experience of the middle class interactive style to "different" pupils; such pupils, in turn, conspire to reduce learning demands (Wertsch, 1985), for example, by failing to draw attention to their queries, their difficulties in understanding may be overlooked. The above research findings indicating class related bias highlights the importance of early (pre-school) education, particularly for those from "previously disadvantaged" backgrounds, that is, children from backgrounds other than a middle class one. Feuerstein's

study (Wertsch, 1993) of North African Jewish children's potential for learning rather than manifest performance is important to bear in mind when trying to determine how best to teach children whose previous mediated learning experiences may have been "deficient" in terms of the current South African educational milieu, based on westernised middle class values and understanding of schooling.

The above research introduces various elements influencing learning. In order to appreciate a comprehensive view of how children understand reality, it is also necessary to consider the potential role of innate maturation on cognitive functioning.

Vygotsky's work emphasises the socio-cultural context as instrumental for learning. His genetic analysis considers changes in types of mental functioning: the phylogenetic, socio-cultural and ontogenetic domains. Mediation is a central notion in Vygotsky's work. It determines the quality of mental functions that develop. Culturally deprived children are described as lacking parental mediation. Mediation connects the individual's actual and potential development. Vygotsky terms this the zone of proximal development. Vygotsky sees language as a socio-cultural product, shaping cognitive functioning. Bakhtin expands on Vygotsky's work by clarifying how individual mental activity and socio-cultural context are connected via semiotic mediation. Wertsch (1993) explains how meaning is shaped by context, i.e. speech genres are influenced by a particular social milieu, eg.

commands in a military setting as opposed to terminology associated with the medical fraternity.

The central role of learning to task performance is underlined in discussions on the effects of class on learning, either directly, eg. through class bias, or indirectly, through parental education level. Ethnicity is mentioned as a possible factor influencing parent mediational style: this is particularly salient in the South African context, where class has often been determined by ethnicity due to apartheid policies. Gender influences on performance may reflect socially incorporated expectations or innate differences between the cognitive functioning of the sexes: research findings appear to be contradictory.

2.3. Piaget and development

In contrast to Vygotsky's focus on learning, Piaget's work emphasises how task performance reflects innate inheritance and maturation. (Donald, Lazarus & Lolwana, 1997). As a genetic epistemologist, Piaget's interest in cognitive development lay in identifying the processes by which bodies of knowledge grow, historically and as internally organised systems (Richmond, 1970). Piaget says that innate mental structures, i.e. genetically based intellectual functioning, initiate actions being performed on objects in the external world. Initially, these take the form of instinctive reflexes, such as sucking. In this way, schemas or internal representations of experiences develop over time and exist as sets of behaviours that can be generalised to future situations. In time, these schemas become logico-

mathematical structures. The internal representations of experience are in a constant state of flux. However, the mental representations are arranged according to interrelated levels of organisation.

2.3.1. Levels of cognitive organisation

Piaget's theory is particularly noteworthy, as unlike many other theorists, he emphasized the fluid nature of intelligence (problem solving ability), which he perceived as constantly developing to higher levels of organisation ("organisation" refers to the internal relatedness of mental parts to one another). The processes involved in the organisation of mental components include assimilation of experiences (that is, the subject's preferred interpretation of sensory data) and accommodation (where schemes adapt to new information assimilated). The application of knowledge gained from past experiences in a current situation would involve assimilation; whereas adjusting that experience to take account of the present would be accommodation. Together, these regulatory mechanisms of assimilation and accommodation lead to the adaption of the intellect to the environment at a given moment. This is known as equilibration (Craig, 1985; Macdonald, 1993).

2.3.2. Equilibration

Central to the conceptualisation of how knowledge develops is the idea of

“equilibration”, i.e. that process leading from certain stages of equilibrium to others, qualitatively different and passing through multiple “ non-balances and equilibriums” (quoted in Craig, 1985, p. 60). Three different forms of equilibrium are described. These are:

- the initial transactions between the intrinsic generative mechanisms and the external objects encountered, i.e. when an individual acts on objects in the environment;
- interactions between schemes developed from the first kind of equilibrium. These schemes are not balanced initially, as they developed at different speeds and therefore require higher formed equilibrium; and
- the establishment of a hierarchy of schemes and structures, where all the individual’s knowledge is integrated into a whole (quoted in Craig, 1985; Thomas, 1992).

The force for equilibration is brought about by imbalances/disequilibriums in the cognitive system, together with a propensity for homeostasis. These disequilibriums manifest differently at different stages of development (Richmond, 1970). Apart from different forms of equilibrium, Pascual Leone’s *Theory of Constructive Operators*, equilibration is differentiated into structures for knowing, acting upon, and changing the environment. The principles involved are:

- **assimilatory praxis** : this means the application of goal-directed behaviour. The choice of which schema to use depends on the silent (unconscious) resources or operators, operating on schemes;
- **equilibration** : this expands on Piaget's notion of equilibration. Pascual Leone sees it as follows :

It is an active disposition of the psychological organism to spontaneously undergo restructurations or structural changes in order to (a) maximize the internal consistency among its functional parts; (b) maximise adaptation (functional payoffs) in its dealing with the environment, i.e. maximize the number of different types of situations with which the organism can successfully interact without having to learn (i.e. to change its internal structures); and (c) minimise internal complexity (organismic structural costs) in its organisation, i.e. organise its psychogenetic and operative constructive processes in such a manner that (a) and (b) are satisfied with a minimum of learnt and innate resources; and

- **bilevel psychological organisation** : this refers to the "choice" among schemes. It comprises : (a) situation-specific constructs which categorise and modify input; and (b) situation free meta-constructs which unconsciously modifies assimilatory strength according to the individual's subjective needs in a specific situation (quoted in Craig, 1985). Despite the detailed data above on the forms and structures of equilibration, it is not clear what causes the initial

lack of homeostasis in a system. However, equilibration is useful in accounting for the transitions between Piaget's different stages of development.

2.3.3. The stages of development

The stages of development are epigenetic, i.e. they are sequentially dependent upon one another and each is characterised by the emergence of particular kinds of mental functioning (Macdonald, 1993).

The first stage of development, "sensori-motor", continues from birth to two years of age. It indicates Piaget's conception of knowledge as being based on the child's acting on objects to construct meaning. Piaget places the pre-school child at the pre-operational stage of development. This stage stretches from age two to age seven (Thomas, 1992). It can be subdivided into two sub stages: symbolic function (2-4 years old) and intuitive thought (4-7 years). It is important to consider the associated characteristics typical of the pre-operational stage, in order to have clear expectations about my research subjects. These characteristics are discussed below.

2.3.4. Characteristics of the pre-operational stage

As the name "pre-operational" implies, children at this stage are as yet unable to perform certain mental operations. Santrock (1997, p.221) says:

operations are internalised sets of actions that allow the child to do mentally what was done physically before.

At the pre-operational level, thoughts are initially poorly organised, and thinking is reliant upon the perception of the immediate context, as opposed to logical thinking or the recall of objects permanent characteristics. As the use of pre-concepts decline in relation to increased experiences, intuitive understanding starts to emerge. Children's logic at this level of development is considered primitive, as they are able to work out a problem without understanding the underlying principle. Similarly, young children are satisfied to perform in order to achieve a task's goal, without self-questioning as to why they succeed (Piaget & Inhelder, 1958; Richmond, 1970; Santrock, 1997)

Pre-operational children are egocentric: reality is unconsciously distorted to satisfy the individual's activity and point of view (Richmond, 1970). Children who are as yet unable to decentre, i.e. those who are unable to contemplate another's perspective, believe that their thoughts have the power to change events. They also find it difficult to conceive that others have different viewpoints, thus they can not distinguish between subjective and objective viewpoints, for example, they do not take into account the perspective of the listener. The three mountains task (see Appendix A, task three) is discussed by Wood (1988), who argues that pre-operational children are unlikely to succeed at this task, as they are likely to choose their own perspective. Other researchers (eg. Donaldson , 1978, in Wood,1988) argue that children can conceptualise different viewpoints, if they have had some experience with the problem situation posed and it makes sense to them. Shatz and

Gelman (1973 in Bee) refute the notion that pre-operational children are egocentric. They point out that children at this level of development indicate an awareness of others by modifying their way of talking for the benefit of children who are younger than themselves. The controversy around the egocentrism of the pre-operational child needs to be kept in mind when analysing research findings.

Piaget says that cognitive development is assisted by language. Initially, thinking is reliant upon the perception of the immediate context, as opposed to logical thinking or the recall of objects' permanent characteristics. This is attributed to innate development. At the pre-operational level of five year old development, children tentatively shift towards a more logical approach by using intuitive thinking, that is, they work out the problem without understanding the underlying principle. Some of their speech is social in nature, but more frequently pre-schoolers tend to use running monologues, egocentric speech aimed at clarifying their own thinking, rather than as an attempt to communicate these thoughts to others. Subjectively perceived task difficulty is associated with an increase in this behaviour (Thomas, 1992).

Apart from linguistic limitations, pre-operational children's thinking is immature. They can not perceive the notion of reversibility, i.e. if the example of $2 + 1 = 3$ is given, children will not necessarily be able to deduce that $3 - 1 = 2$. Reversibility typically emerges at six years of age. A lack of reversibility explains why

conservation tasks are problematical for the pre-operational child (Bee, 1981). Conservation refers to the understanding of the permanence of core attributes of objects or situations, despite superficial changes (Santrock, 1997). Underlying all measurement, for example, is the notion that an object remains constant in size throughout any change in position, thus conservation is needed before measurement problems can be resolved. Piaget's work provides an illustrative example. He asked children to compare matchstick pathways: one pathway comprising the matchsticks placed horizontally end to end; the second pathway placed beneath the first one, comprising matchsticks placed at an angle to one another, forming a zigzag. Young children, 5 years 10 months old, tended to judge the length of the pathways by looking at the extremities, i.e. the initial and end points. By 6 years 3 months there were signs that for some subjects conservation was starting to emerge. Piaget refers to this as an "intermediate" level of conservation. Pre-operational children have problems with subdivision and conservation of the whole, for example, they do not realise that the sum of all parts must necessarily equal the original whole (Piaget, Inhelder & Szeminska, 1960).

Pre-operational children show transductive (intuitive) thinking. They try to make inferences about the relationship between two things, tending to link things by virtue of their proximity (temporal or spatial) to one another. This pre-logical reasoning tends to result in inaccurate conclusions being formed. An example would be when a child presumes that afternoon has not occurred, because she has

not yet had her usual nap. Pre-operational children tend to link things by virtue of their proximity to one another. (Bee, 1981; Richmond, 1970).

Pre-operational children use juxtaposition and syncretism. Juxtaposition refers to the way in which children tend to focus on parts of a situation or object, without correctly relating them into a whole. Syncretism means that children focus on the whole of an experience, without perceiving how the separate parts interact, for example, they might say that “the wheels of a bicycle make it go”, but also that “the wheels turn because of the bicycle”. Juxtaposition and syncretism indicate pre-operational children’s inability to synthesize parts and the whole of an experience into a related group (Richmond, 1970).

The child at the pre-operational level uses centration and static representation. Centration indicates that children tend to fixate on one aspect of a changing relationship (juxtaposition or syncretism), to the exclusion of other aspects, for example, when comparing two containers with different quantities of liquid, they may focus on the height of the liquid, without taking into account the compensatory width of the different containers. Children at the pre-operational level of development find it difficult to dissociate height from volume (Santrock, 1997; Thomas, 1992). Wood (1988) says that children under seven years of age “centre” on either the overall configuration or its parts, but cannot perceive both simultaneously. Static representation means that children cannot manipulate mental

representations so as to realize that different arrangements of the same things still comprise the same constituents.

Kasdorff and Schnall (1970) indicate that younger children (pre-operational) can not integrate discretely presented stimuli, though older children can do so. Initially, children deal with single features of a problem. They work with images, trying to match what is before them with some specific mental image based on prior concrete experience. In time, children are able to deal with several alternatives simultaneously, with inclusive inferences made possible by hierarchical cognitive structures. From then on, as information analysis rather than image-matching is used, children progressively develop towards less dependence on redundancy and proceed in the direction of much more efficient information processing (Bruner et al., 1967). The above review shows a composite picture of the characteristics expected in children functioning at the pre-operational level of development.

In contrast to Vygotsky's work, Piaget's focus is on how innate maturation affects cognitive development. Intrinsic generative mechanisms (innate mental structures) initiate actions performed on the external world. In time, internalised representations of experience, i.e. schema or operations, develop as sets of actions, which can be generalised to future experiences. Internal mental structures organise themselves by means of assimilation (subjective interpretation of information being processed) and accommodation (adaptation of the information, taking into account

novel features of a situation). Together, these processes adapt the intellect to the environment. This is referred to as equilibration. Pascual-Leone (quoted in Craig, 1985) expands on this central notion of equilibration. Piaget identifies universal and sequentially invariant stages of development. Pre-school children are assumed to be at the pre-operational level of cognitive development. Properties associated with pre-operational cognitive functioning are described. These include: egocentrism, reversibility, conservation, transductive thinking, juxtaposition and syncretism, centration and static representation. All of these characteristics emphasize the role of innate maturation in task performance. The interaction between cognitive functioning and language emphasises the innate acquisition of language. Piaget considered much of the language used at the pre-operational level of development as egocentric, rather than as being aimed at social communication.

2.4. Specific factors

Vygotskian and Piagetian theories imply either a learning or a developmental perspective. In order to explain cognitive changes, the following specifically mentioned factors (i.e. age, gender and a second language) further highlight how research tends to conceptualise change in terms of an either/or dichotomy.

i) Age

Piaget's focus on innate development implies that chronological age (i.e. innate development) affects task performance. Hyde (1970) stresses that it is a child's mental (i.e. the effects of teaching expanding on innate development) rather than chronological age which determines success on tasks. His findings that same age children in different communities varied in their ability to succeed at Piagetian type tasks, imply differential mediation (i.e. guided learning) rather than universal development alone.

ii) The influence of gender

Class and/or culture may account for differential socialisation, including attitude to gender. Hoffman and Kloska (1995) compare the scores of parents assessed in terms of degree of stereotyped attitudes to child rearing with the scores of their daughter's achievement tests. The results indicate that parents with less stereotyped attitudes to child rearing have daughters who achieve higher scores. Greater stereotyping is associated with parents from lower classes and with less education. Nadelman (1970) says that awareness of traditional gender roles is more pronounced in working class girls than in middle class girls. It is stated that less gender polarisation might occur if this United Kingdom study were replicated in the United States of America. This point needs to be kept in mind when assessing gender related findings in the South African context. Gender related to class and culture seem to indicate how learning is implicated in these findings.

Burnstein, Bank and Jarvik (1980) say that clear sex differences exist in cognitive functioning. However, they are uncertain as to whether the underlying determinants are genetic or cultural. I.Q. tests considered free of gender bias seem to indicate that females perform better on verbal abilities throughout their life span. Males are often said to do better on spatial tasks: some say this starts between ages six to eight; others think this occurs in adolescence (quoted in Burnstein, Bank & Jarvik, 1980). However, criticisms of this assumption indicate that spatial tasks are not homogeneous. There is no convergent validity on currently available tests.

Another controversial finding is that males are less field dependent on spatial tasks. Field dependence is associated with the personality characteristic of “connectedness” attributed to females (Witkin in Burnstein, Bank & Jarvik, 1980). This finding implies that performance variation may be accounted for by innate gender characteristics. However, the data has been confusing and contradictory: the authors therefore warn that careful interpretations of gender-related data should prevail. Archer and Waterman (1988) challenge the traditional view that males and females have dialectical characteristics, for example: connectedness; individuation. Their findings are gender neutral, indicating that people may have both characteristics.

iii) The influence of a second language

McLaughlin (1982) notes the connection between first and second language acquisition. He refers to similarities found between first and second language learning (eg. Dulay & Burt, 1973, 1974), but also to the essential difference between these abilities. He quotes Felix (1975), indicating the qualitatively different cognitive processing that a second language requires. Taylor (1975 in McLaughlin, 1982) notes that the first language interferes with the acquisition of the second language. McLaughlin (1982) concludes that older children (early adolescence) learn a second language quicker and better than do young children.

In Wertsch (1985), the acquisition of a second language is described as being dependent upon the level of development of the native language. In a study of Finnish immigrant children in Sweden, older children (ten years) fared better than younger children when learning a second language, because of literacy skills and other more mature cognitive abilities.

Collinson (1974 in Wertsch, 1985) concludes that education in a foreign language may interfere with children's conceptual development. This implies that all learning in a second language is inhibited by the effects of the second language. Macdonald (1993) confirms this in her findings that language learning constraints of black children in the state system interfere with their concept learning. Similarly, children who learn a second language before they have a complete grasp of their first

language (usually at about five years of age), will have less mental capacity for other cognitive tasks. It is important that a high proficiency in the first language is established, before a similar level in the second language can be developed (Young and Schiebush, 1995). In a more compromising attitude, Ramirez et al. (1991 in Donald, Lazarus & Lolwana, 1997) suggest that an “additive” model of teaching be implemented, where children receive at least 50% of their school instruction in their home language in the first several years of their education. The above findings imply the importance of innate maturation as a pre-requisite to learning.

MacLaughlin (1982) says that more recently, researchers are showing an increased interest in considering second language acquisition from the perspective of the interaction between learners and their context.

Age, gender and the influence of a second language on cognitive functioning are specifically mentioned to highlight the contrast between a learning and a developmental perspective. This contrast indicates a dilemma in adopting an either/or understanding of cognitive functioning and implies the need for an interactional consideration of how children understand reality.

2.5. Interaction

Different theories combine learning and developmental aspects of cognitive functioning in different ways. The manner in which these aspects are combined tends to indicate a bias towards either a learning or developmental perspective. Wertsch, building on Vygotsky's work, moves toward an interactional perspective: he regards the person acting with mediational means as an irreducible unit. Spencer and Karmiloff-Smith (1997) distinguish between: (a) the contents of social stimuli (i.e. what information may be available in the environment:- this may vary across culture); and (b) processes of learning (i.e. what the child is able to process and store mentally, as well as use for problem solving: this is unaffected across cultures). They say that children learn to distinguish between what they can solve unaided and what requires adult assistance. Gellatly, (1997) adds context to Spencer and Karmiloff-Smith's notions of contents and processes. Gellatly (1997) emphasises that children's grasp of reality is more likely to be influenced by exogenous factors. More specifically, adults influence children to re-conceptualise things according to the way the adults perceive them.

Case (1992) building on Piaget's work, presents a framework for an interactional understanding of cognitive development: he combines the notion of the individual's innate maturation with that of context specificity. Case's theoretical work developed to redress perceived shortcomings of Piaget's work, for example the

discrepancy between when the development of conservation of mass occurs as compared to when the development of number conservation occurs. This “horizontal decalage” is queried by Bruner (1997). He asks why systemic growth in one domain of knowledge does not always generalise to others? Similarly, Wertsch (1993) queries why anyone would regress to a lower than available level of mental functioning. Case (1992) proposed a theory of development based on many of Piaget’s assumptions. Case says that development proceeds along many fronts at once, at different rates (i.e. it is domain specific), in a continuous and contextually sensitive manner. He sees the rate of developmental change in any cognitive area as regulated by a system-wide change in the processing capacity of intellectual control structures. The control structures contain three representational components: i) the essential features of some particular class of problem; ii) the goals of this problem class; and iii) a sequence of operations that will bridge the gap between the problems initial and terminal states. Problem solving becomes increasingly “culture bound” in terms of the types of problems encountered and the role models available. The motivation for problem solving goals and the methods for solving these problems, are influenced by the particular culture of which an individual is a member. However, the influence of a specific context on problem solving ability depends on innate development.

Case (1992, p.49) says that biological development sets the ceiling on the mental operations that children can use (and the working memory for products of such

operations) at a specific time in development. Control structures develop through four recursive cycles in each problem domain. That is, 1) new operations are assembled to solve a problem, by co-ordinating two well established operations already in an individual's repertoire; 2) with practise and increasing working memory, two of the above operations can operate in sequence; 3) two or more operations in parallel are carried out and the products of the operations are integrated into a coherent system; and 4) these then form the basis of the next developmental stage.

2.6. Conclusion

If learning on its own is responsible for task performance, one would expect to see the greatest task performance variation according to class, with the middle class children performing considerably better than children from other classes. Any variations in task performance associated with language, parent education level or gender, might be considered as reflecting an underlying class influence. One would not expect the slight age differences in this sample to account for differential performance, as previously mentioned in Hyde's (1970) research findings. If the findings vary from this pattern, one would want to look at the effect of biological maturation on development. In terms of development, age differences would be expected to account for most of the variation in task performance. Differences would also be expected if children are tested in a language other than their mother

tongue, particularly as they are young (under ten years of age). Gender related findings would need to be treated with caution, as the associated research is controversial. If neither the learning nor the development trends emerge clearly in the findings, one would favour an explanation which emphasises the interaction between learning and development.

The above literature review showing either a bias towards learning, innate development or the interaction of these factors, lays a foundation for the subsequent sections of this dissertation. More specifically, in analysing and discussing my research findings, it will be necessary to bear in mind the foci of these apparently differing, though often complementary theoretical orientations. In the next section, more emphasis is given to the practical details of the present research. Thereafter, the discussion section will compare the theoretical data with the actual findings of the present research and discuss possible implications for education.

SECTION 3. METHOD

3.1. Methodology

Research design:

The research design chosen is of a pre-test, post-test format (cf. Appendix B). This offers some degree of extraneous variable control, by comparing each subject to him or herself. That is, the initial performances of subjects are compared to their later, mediated performances on the same tasks. The difference between the first and second assessments is attributed to learning and direct teacher input. However, practice effects may also influence the results (Kerlinger, 1973).

The research followed as close as possible to the usual activities occurring in a pre-school classroom. The tasks are presented in a relatively playful manner, consistent with pre-school educational norms, for example, the subjects are prompted in the second round of assessments by being asked if there is “a trick” in the task, i.e. they are cued to anticipate that problem solving is expected of them. (Hendrick, 1980).

Research subjects:

The research subjects are selected as being a naturally existing heterogeneous group. The subjects' limited concentration spans are taken into account by presenting the different tasks on separate occasions. In this regard, Hendrick

(1980) suggests that cognitive tasks are taxing for pre-schoolers and that such activities should be kept brief. A small table for individual work and a chair facing a blank wall are also aimed to minimise distractions from the task at hand. These ideas are taken from recommendations for working with children with attention difficulties (Randall, 1998). Although the task assessments are done in the classroom during normal school hours, excessive interruptions are avoided by directing the class to seek assistance from the class assistant rather than from the teacher, when assessments are in progress.

The subjects are not interviewed to discuss their subjective opinions about interacting in the research. This is deliberately avoided, as the researcher believes that pre-school children tend to say what they perceive their teacher would like to hear. As noted, the subjects' real opinions are more accurately gauged by their responses to being invited to perform the tasks.

Researcher:

The researcher is the teacher of the research subjects, not an unfamiliar outsider. The research design includes the researcher as participant observer. This position is easily accepted by the subjects as the researcher is also the usual teacher engaged in the activity of questioning and note taking required of pre-school teachers. The implementation of the research during the second half of the school year ensures that all the subjects are familiar with the researcher and are thus more likely to feel

at ease in the assessment situation. Familiarity of the tester to the research subjects is associated with better task performances, especially if sufficient time and encouragement for tasks is also forthcoming (Bee, 1981).

Research tasks:

The tasks used in the research are of a kind with which the pre-school subjects are already familiar. More specifically, pre-schoolers at this school are expected to spend part of the morning playing with educational games. They seek adult assistance only for confirmation of their success on tasks or when they are unable to proceed without guidance. According to Hendrick (1980) the learning of new ideas occurs most successfully when it is based on what individuals already know (Hendrick, 1980). The Piagetian tasks used in this research are based on familiar concepts (i.e. colour, shape, size) taught to all the subjects in the first half of the year. The research design follows the normal classroom teaching procedures by repeating the same tasks at a later date. The subjects are assessed on the same tasks twice. The initial assessment provides a measure of independent problem solving ability; the second assessment indicates the degree to which the subjects benefit from teaching. Field notes record some qualitative observations eg. the degree of concentration exhibited.

Task 1:

The first task requires an appreciation of the one to one correspondence between the six eggs and six eggcups, regardless of their spatial arrangement in relation to one another.

Task 2:

In the second task, subjects are faced with three dough mountains on a dough board. The task requires decentration, that is, the subjects are asked to select a two dimensional card representing the position of the mountains relative to one another from the perspective of a doll, placed at right angles to the position of the subject.

Task 3:

The third task requires subjects to say whether there are more plastic or more blue beads. All the beads are plastic: four of the beads are blue and two of the beads are red.

Task 4:

The fourth task requires an understanding of conservation of quantity. A lump of dough is subdivided into smaller portions. Subjects are asked which arrangement indicates a larger quantity.

Task 5:

The fifth task requires subjects to mentally reverse the spatial positioning of a sequence of different coloured beads.

Task 6:

The sixth task requires subjects to resolve the problem of changing container contents without mixing these together. Two containers each containing different coloured dye and an empty container are presented.

Task 7:

The seventh task requires subjects to say which container has more liquid. This involves the ability to take into account not only the height of the liquid in the containers, but also the width of the containers.

The tasks are aimed slightly above the anticipated developmental level of the subjects. However, the tasks accommodate the pre-operational level of development as they allow for the manipulation of items, not just for the manipulation of internal, symbolic ideas. These objects are especially useful for subjects with limited English vocabulary, as problem solving can, in some instances, be demonstrated rather than verbalised, for example: in the sixth task, a subject may pour the dyed water into the appropriate containers without much reliance upon expressive language i.e. only receptive understanding of the task directions is required. Piaget and Inhelder (1969) say that it is important for pre-operational children to have “hands on” experiences - with language as an accompaniment rather than a replacement for learning through the senses.

Follow up questionnaires:

It was decided to use follow up questionnaires in order to gauge subjects' subsequent performance at school. This involves the co-operation of teachers from eight different schools. It is hoped that their assessments will add valuable insights into whether participation in the research has any long-term implications.

Constraints and criticisms:

In an analysis of the constraints and criticisms of the present research, one feature to consider is the position of the researcher as teacher. Stenhouse (1975) argues that teachers should be involved in research aimed at improving education, as their subjective perceptions are what influence classroom practice. The position of teacher as researcher indicates a subjective bias in implementing the tasks and in interpreting the data. The biased position of the teacher as researcher may be minimised if the research is implemented at the beginning of a school year, when the subjects are less familiar to the researcher. It is argued that this would be at the cost of the willingness of subjects to participate, at least in a voluntary or relaxed manner.

A further limitation of the current research is that the sample size is too small to be able to generalise findings to other populations. Similarly, the subdivisions within the sample are too unequal and small in size to allow for refined statistical manipulation. The research aims to explore the possible patterns that may emerge

in terms of how the factors: age, language, class, parent education level and gender effect the learning–teaching situation. The present study provides a framework for more detailed future research.

3.2. The pilot study

Subjects:

In the initial pilot study, a sample of three girls and three boys, one each from the middle, working and lower classes, was selected. Class was assessed according to parent occupation or the parents' highest educational attainment, and residential area, reflecting socio-economic status. This information was obtained from school admission forms completed by all pupils' parents when their children initially entered the school. The subjects from the middle and working classes were arbitrarily selected, i.e. those subjects matching the class and gender requirements and showing a particular interest in participating. However, the subjects from the lower class were not arbitrarily selected, as there were only two subjects available in this class. In the suburb where the school is situated, residential areas consist of a large middle class area, a smaller working class area and an informal settlement (designated as "lower class" in this study). These subgroups are largely, though not exclusively, determined according to ethnic group. This categorisation is similarly reflected in the present research sample.

Tasks:

The pilot study was undertaken to gauge whether any clear differences between children emerge in terms of gender or/and class. The outcome of the pilot study was used to suggest whether further research on the research topic was warranted.

Classification tasks were used. That is, tasks grouping items according to perceived similarities or differences between them, eg. putting all the white objects in one pile and all the black objects in another pile. Two classification tasks were used.

Task 1:

The first task consisted of classifying plastic shapes (circles, squares, rectangles and triangles. according to perceived understanding of the instruction to: “put the ones that are the same together”. The plastic shapes also varied along the dimensions of thickness (thick or thin) and colour (red, blue or yellow). After an initial attempt at this task, children were asked if they could think of an alternative way of grouping the shapes, i.e. according to another dimension.

Task 2:

The second task consisted of two-dimensional cards. The children were requested to sort these according to perceived similarities. The cards varied according to shape, size and colour. After both the three and two-dimensional tasks, the children were asked to explain how they had classified the shapes or cards.

The classroom language is English: instructions were given in this medium and responses in English were anticipated. The tasks were done independently of teacher mediation. It should be noted that the dimensions of colour, shape, size and thickness used in these tasks are typically taught in the first half of the pre-school year and were therefore relatively familiar to all the children in the sample. Also, the three-dimensional task (i.e. where objects which could be manipulated were available) was presented prior to the two dimensional task (where only the symbolic forms of objects are available). This sequenced the tasks according to perceived difficulty level.

Classification tasks were used as the ability to classify is perceived as fundamental to the development of more advanced skills, eg. visual sequencing, that is, being able to repeat a visual pattern eg. following a blue, then red, then white bead sequence with a similar positioning of blue, red and white beads. Visual sequencing, in turn, is fundamental to the ability to discriminate between different letters and the ability to sequence these letters to form words.

Results:

The results from the pilot study were very interesting and encouraging in terms of undertaking further research into the specific understanding that individual children at the pre-operational level of development manifest. The middle class subjects both sorted the three dimensional shapes according to the shape dimension, that is

they put the circles in one pile, the squares in another pile and so on. The working class subjects varied in their ability to manage the given task. The working class girl was perplexed by the different dimensions i.e. shape, colour and thickness co-occurring in the task and did not initially manage to classify the shapes according to any meaningful categories. The working class boy in contrast to the working class girl, classified the shapes according to all the dimensions simultaneously, eg. he placed the thin, blue rectangle with the thick, blue rectangle. The lower class subjects sorted the shapes according to shape and thickness, respectively. In the subsequent categorisation attempts, the middle class and lower class subjects sorted the shapes along the colour dimension, thickness of the shape or according to all the dimensions simultaneously; the working class subjects were unable to think of alternative classification procedures, though the subject who initially struggled to categorise the shapes finally managed to arrange the shapes according to colour. The table below aims to clarify the findings of this introductory task.

Subjects	Trials on the three dimensional task		
	1.	2.	3.
middle class*:	1 shape ^y	shape (1 of each shape)	shape (1 of each shape)
	2 shape	colour ^z	thickness ^x
working class:	1 —	—	colour(1 shape of each)
	2 all 3 dimensions	—	—
lower class:	1 shape	colour	all dimensions
	2 thickness	thickness(1 colour of each)	colour (1 colour of each)

TABLE 1: THREE DIMENSIONAL TASK RESULTS

Key:

* 'Class' is defined according to parent occupation and/or highest educational attainment, and residential area, reflecting socio-economic status.

^y 'Shape' refers to circular, triangular, square or rectangular shapes.

^z 'Colour' refers to blue, yellow or red shapes.

^x 'Thickness' refers to whether the shapes were thick or thin.

All dimensions refers to the shapes being sorted according to shape, colour and thickness simultaneously.

The dashes in the table above, indicate that the subjects are unable to comply with the task demands.

In the two-dimensional task, the differences between the subjects from different classes are more apparent. The middle class subjects show a tendency to

classifying the cards according to both size and shape; the working class subjects preferred to classify the cards according to colour; while the lower class subjects classified the cards according to size.

3.3. Method

The present research uses a pre-test, where subjects are tested without teacher input to guide them. This was followed two months later with a post-test, where the same tasks as used in the pre-test were reapplied, but with teacher guidance. A year subsequent to the first and second assessments, a follow up questionnaire was used to ascertain the current performance of the research subjects in comparison to their aforementioned performances. The following discussion focuses on the classroom context in which the research was carried out, the characteristics of the research subjects, the research tasks, the time frame involved in gathering the data, and the way in which the data was analysed.

3.3.1. Classroom:

The present research is carried out in the researcher's pre-school classroom. The research is undertaken in a partially government subsidised pre-primary school in a suburb of Cape Town. The school has approximately twenty seven children in each of the five classes. Each class has a qualified teacher as well as an unqualified, but experienced, assistant. The daily programme is fairly informal, alternating between

freely chosen and teacher directed activities. School readiness assessments form a continuous part of the programme, so that the children are used to being challenged with new activities.

3.2.2. Subjects:

The children (now referred to as “subjects”) in this project are chosen from a ready made group, being part of the researcher’s pre-school class.

First and second performance assessments

Total sample:

Twenty four subjects are used in the research sample for both the first and second task assessments. The few children in the class excluded from the sample are those pupils serendipitously away on vacation during the research period. For analysis the subjects were divided on a range of factors. Although overlaps may appear in the nature of the factors divisions were made into mutually exclusive groups by the researcher based on what she felt was the best fit.

Age:

The subjects’ age range is seventeen months, with a mean age of five years and eight months

Language:

In this sample, English as a home language predominates, with eighteen of the twenty four subjects in this sub-grouping. Four subjects speak English and Afrikaans; two subjects speak an African home language (Zulu/Xhosa).

Class:

The sample reflects a middle class bias. The eighteen middle class subjects are not the identical subjects as in the English language subgroup.

Parent Education Level:

An examination of the parents' education level indicates four subjects with parents having post-graduate qualifications, fourteen subjects with one or both parents having some tertiary education, and six subjects having parents with no tertiary education.

Gender:

The group is divided into equal numbers of each gender.

Follow Up Data:

Twenty three of the original research subjects are involved in the follow up research. That is, their current teachers in pre-school or grade I are asked to provide assessments of the subjects current academic performances.

3.2.3. Tasks:

The primary source of data for the present research is derived from two applications of each of seven tasks administered to each of the subjects individually. The tasks derive from similar ones devised by Piaget for analysing children's intellectual level of development. As noted previously, these tasks are anticipated as being slightly advanced for children in the pre-operational stage of development.

The first task trial is in August 1997. Subjects are asked to attempt the tasks independently during this assessment. The initial performances establish a baseline in terms of independent ability. The tasks are then sequenced in order of difficulty, according to the samples' initial performances (see task order in Appendix I). The second round of task trials is in October of the same year. During the second round of task trials, subjects are guided in their attempts to resolve the tasks according to their individual requirements. The second performance involves teacher guidance on the same tasks as used in the initial assessments. More specifically, the subjects are prompted whenever they hesitate, in order to try to guide their thinking towards the resolution of the task. The prompts used are provided in the form of leading questions or exhortations to look carefully at specific features of the problem situation. The initial and second performance results are compared to see what, if any, effects teaching has on the baseline performances. These findings are theorised in terms of grasp of reality. Differences

are analysed to determine whether there are any patterns in the findings according to age, language, class, parent education level or gender, in terms of benefiting from teaching.

3.3.4. Scheduling:

The present research was carried out between August and October, 1997, during normal school hours. The children were given as much time as required to complete each task (Bee, 1981). Only one task was presented to a subject on any one occasion (Hendrick, 1980). Each child was therefore assessed on fourteen different occasions for the research. A year subsequent to the initiation of the research tasks, a follow up assessment of subjects' general academic performances is made by the subjects' current teachers.

3.3.5. Analysis of the data:

First and second performance assessments

Subjects are scored according to whether they succeed on each of the seven tasks or not i.e. in a dichotomous fashion. The children are scored after being allowed any number of trials in order to try to resolve the problem at hand. In the second performance assessments, the children are scored similarly to the first trial, but scores are thought to reflect the degree of learning that has occurred i.e. the relative success of the teacher's mediation in relation to the children's independent performances. Field notes record some qualitative observations eg. perseverance

and concentration of the subjects on task. These notes are indicated in the tables in the next chapter. Five separate tables are used in the initial and again in the secondary assessments to represent task performance according to the factors: age, language, class and parent education level and gender. Pie diagrams are also used to analyse the data according to these factors (see Section 4).

Age:

For the age diagrams, the sample is divided along the median to obtain an older and a younger subgroup.

Language:

For the language diagrams, the sample is categorised according to prevailing home languages: English, Afrikaans or an African language (Xhosa or Zulu).

Class:

For the socio-economic class diagrams, the sample is categorised according to middle, working or lower socio-economic class, based on their parents' occupation and residential area, as mentioned previously.

Parent education level:

The sample is also analysed in terms of the education level of subjects' parents.

The diagram for this factor indicates that the sample is divided into three, with the

A group consisting of four subjects whose parents have post-graduate qualifications; the B group consisting of fourteen subjects whose parents have some form of tertiary education, exclusive of post-graduate qualifications; the C group consisting of six subjects whose parents lack tertiary qualifications.

Gender:

The diagram representing gender data is divided according to female and male subjects.

Follow up data:

A year subsequent to the first and second task performance assessments, a follow up assessment of subjects is done by requesting these subjects' subsequent teachers to rate the general academic performance of each individual concerned and to comment on their assessments. Questionnaires (cf. Appendix B) are used to gather this data, either directly from the teachers or via telephone interviews with them.

This data is then compared to my own research assessments of the subjects.

SECTION 4. RESEARCH FINDINGS

4.1. Introduction

The research findings presented here include the data produced through the first and second task trial performance assessments and from the follow up assessments. The data is presented firstly as pie diagrams, indicating number comparisons; and secondly, observation schedules, which were used in the task assessments and are now presented in table form. In the pie diagrams, the total sample's performance is presented before data indicating the performances presented according to age, language, class, parent education and gender. Correct and incorrect responses are clearly indicated in each diagram. In the following pie diagrams, I present firstly the findings from the initial round of task performances; secondly, the findings from the second round of task performances.

4.2. Pie diagrams

In the diagram below (1), I present the findings of the initial performance results of the total research sample.

First performance data: total sample
Total responses before teaching (n= 168)
(24 of 24 subjects)

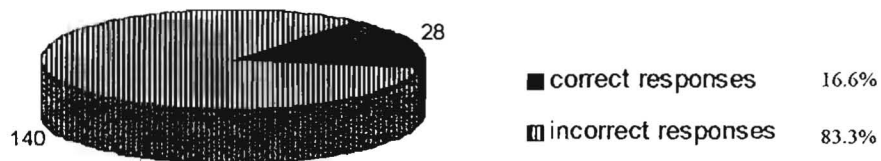


Diagram 1: Total sample responses to the tasks

Notice the number of the subjects who do not succeed in these tasks, performed without teacher mediation.

In the following diagram (2), I present the findings of the total sample's performance after teaching.

Secondary performance data: total sample
 Total responses with teaching (n=168)
 (24 of the 24 research subjects)

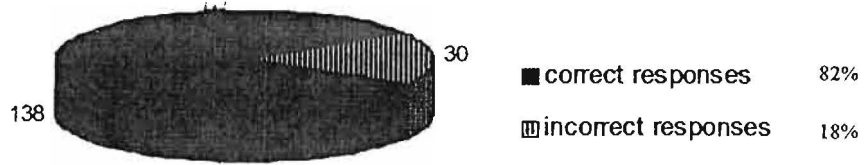


Diagram 2: Total sample

Notice that one hundred and thirty eight of the one hundred and sixty eight possible responses are correctly managed, now that teacher mediation is forthcoming.

In the following diagrams (3 and 4), I present the findings of the performance results of the older and the younger halves of the class, before teaching.

First performance data: age

Older half of the class before teaching (n=84)
(12 of the 24 research subjects)

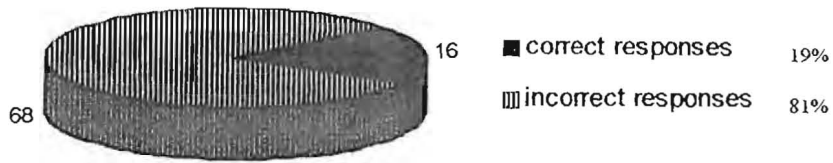


Diagram 3: Older half of the class

Younger half of the class before teaching (n=84)
(12 of the 24 research subjects)

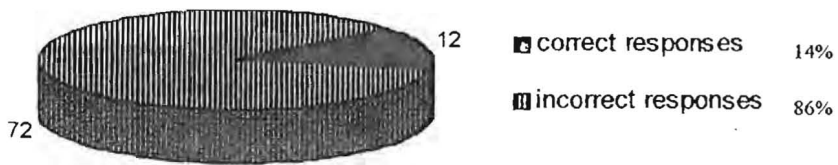


Diagram 4: Younger half of the class

Notice that the older subjects perform marginally better than the younger subjects.

In the following diagrams (5 and 6), I present the findings of the older and younger halves of the class after teaching.

Secondary performance data: age
Older half of the subjects with teaching (n=84)
(12 of the 24 research subjects)

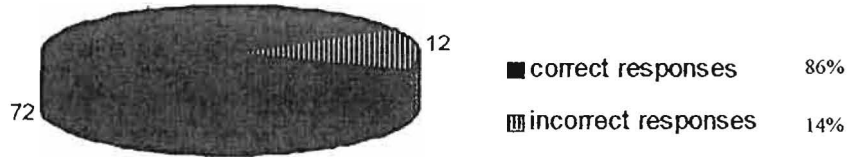


Diagram 5: Older half of the subjects

Younger half of the subjects with teaching (n=84)
(12 of the 24 research subjects)

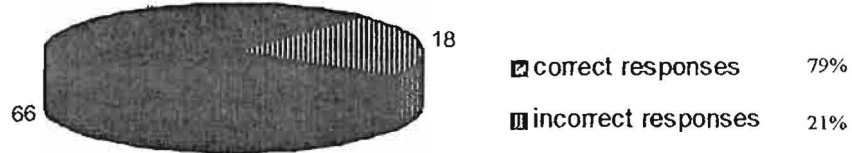


Diagram 6: Younger half of the subjects

Notice how the older subjects perform better than their younger counterparts, which is to be expected.

In the diagrams (7, 8 and 9) below, I present the findings of the English, Afrikaans and African languages groups' initial performance results.

First performance data: language
 English speakers before teaching (n=133)
 (18 of the 24 research subjects)

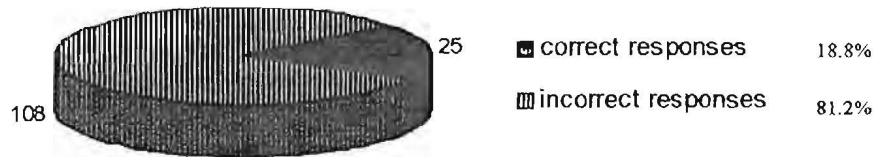


Diagram 7: English speakers

Afrikaans speakers before teaching (n=22)
 (4 of the 24 research subjects)

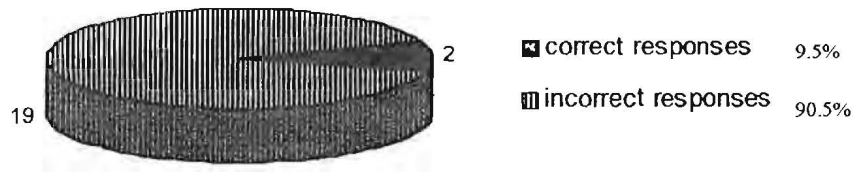


Diagram 8: Afrikaans speakers

African language speakers (n=14)
 (2 of the 24 research subjects)

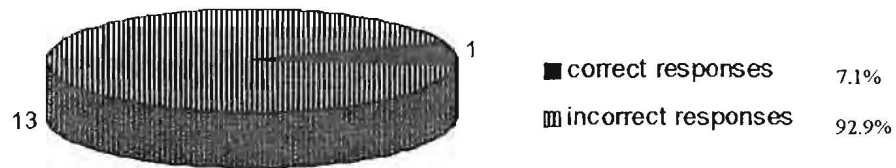


Diagram 9: African language speakers

Notice that the English speakers perform almost twice as well as the other language groups.

In the following diagrams (10, 11 and 12), I present the findings of the different language groups subsequent to teaching.

Secondary performance data: language
English speakers with teaching (n=133)
(18 of the research subjects)

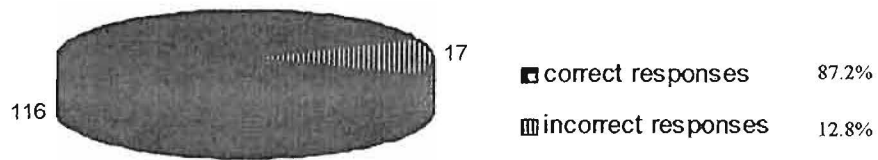


Diagram 10: English speakers

Afrikaans speakers with teaching (n=21)
(4 of the 24 research subjects)

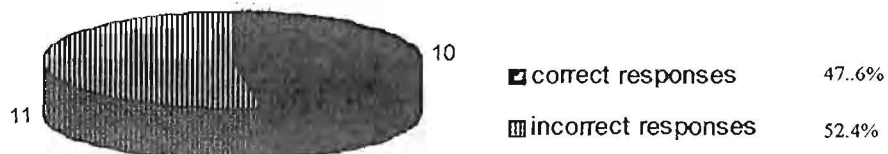
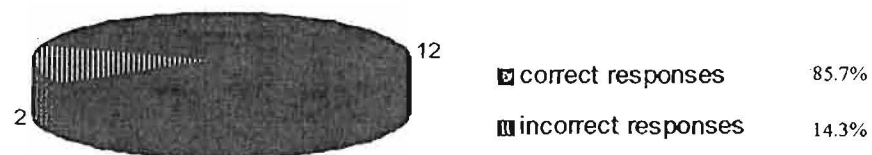


Diagram 11: Afrikaans speakers

African language speakers with teaching (n=14)
(2 of the 24 research subjects)



Diagrams 12: African language speakers

Notice how the Afrikaans speakers' performance lags behind that of the other subjects.

In the diagrams (13, 14 and 15) below, I present the results of the initial class performances.

First performance data: class

Middle class subjects before teaching (n=146)
(18 of the 24 research subjects)

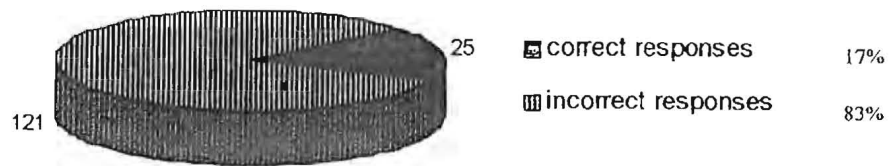


Diagram 13: Middle class subjects

Working class subjects before teaching (n=28)
(4 of the 24 research subjects)

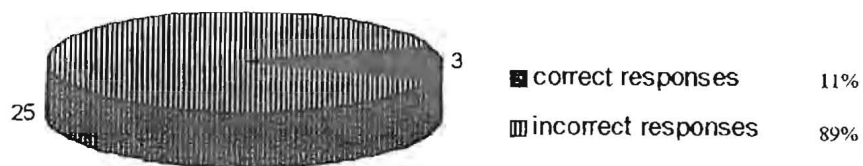


Diagram 14: Working class subjects

Lower class subjects before teaching (n=14)
(2 of the 24 research subjects)

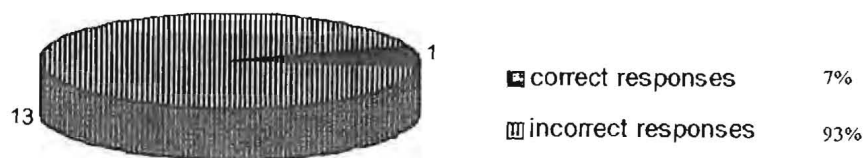


Diagram 15: Lower class subjects

Note the superior performance by the working class subjects in comparison to the other subjects. Given the school's middle class bias, this finding contradicts the idea that the school's class bias will favour those from a similar class background.

In these diagrams (16, 17 and 18), I present class related findings after teaching.

Secondary performance data: class

Middle class subjects with teaching (n=126)

(18 of the 24 research subjects)



Diagram 16: Middle class subjects

Working class subjects with teaching (n=28)

(4 of the 24 research subjects)



Diagram 17: Working class subjects

Lower class subjects with teaching (n=14)

(2 of the 24 research subjects)

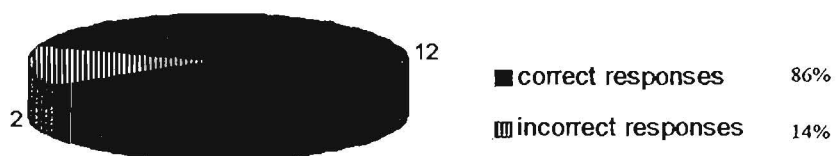


Diagram 18: Lower class subjects

Note that the working class subjects fare considerably worse than the other subjects.

In the diagrams (19, 20 and 21) below, I present the findings linked to parent education level.

First performance data: parent education level

Group A before teaching (n=28)
(4 of the 24 research subjects)

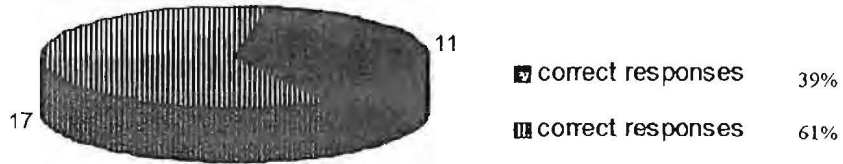


Diagram 19: Group A Parent Education Level

Group B before teaching (n=98)
(18 of the 24 research subjects)

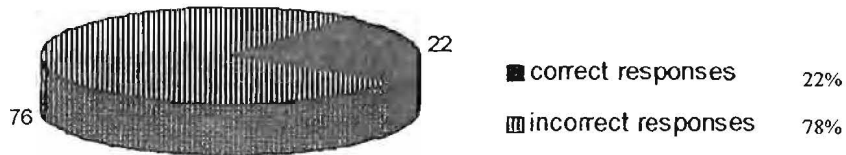


Diagram 20: Group B Parent Education Level

Group C before teaching (n=42)
(6 of the 24 research subjects)

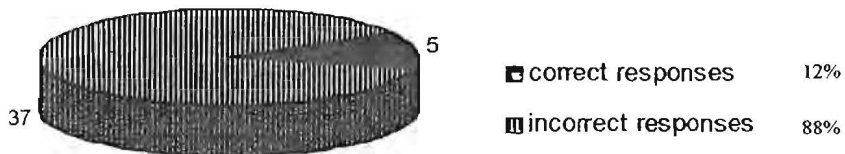


Diagram 21: Group C Parent Education Level

It can be observed that group A performs better than group B and group C, thus, showing that parent education level corresponds with performance.

In the diagrams below (22, 23 and 24), I present the findings associated with parent education level after teaching.

Secondary performance data: parent education level

Group A with teaching (n=28)
(4 of the 24 research subjects)

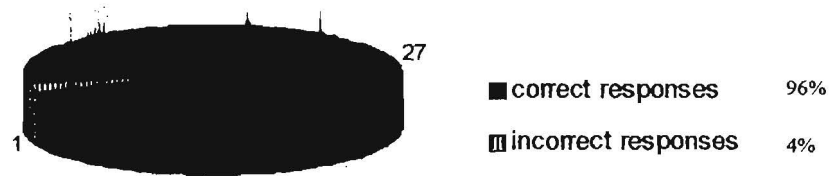


Diagram 22: Group A Parent Education Level

Group B with teaching (n=98)
(14 of the 24 research subjects)

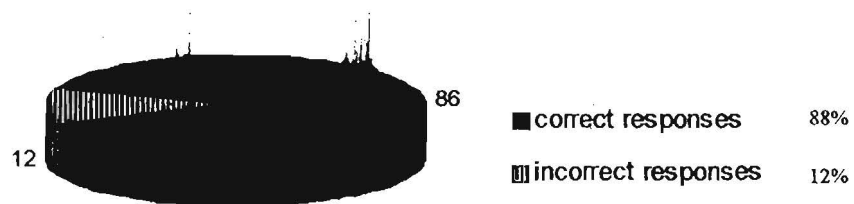


Diagram 23: Group B Parent Education Level

Group C with teaching (n=42)
(6 of the 24 research subjects)



Diagram 24: Group C Parent Education Level

It is observed that parent education level and performance success correlate.

In the diagrams (25 and 26) below, I present the findings associated with gender.

First performance data: gender
 Girls before teaching (n=84)
 (12 of the 24 research subjects)

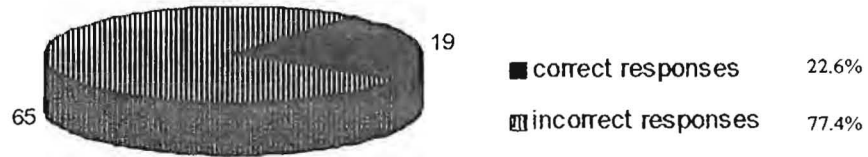


Diagram 25: Girls

Boys before teaching
 (12 of the 24 research subjects)

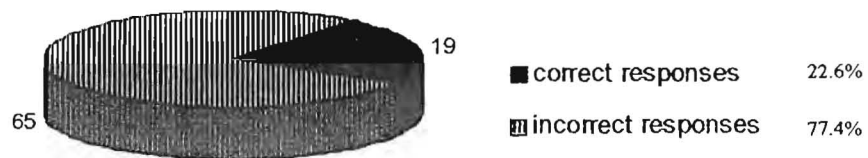


Diagram 26: Boys

Note that the girls and boys achieve exactly the same ratio of correct to incorrect responses.

In the following diagrams (27 and 28), I present the performance results of the girls and boys after teaching.

Secondary performance data: gender

Girls with teaching (n=84)
(12 of the 24 research subjects)

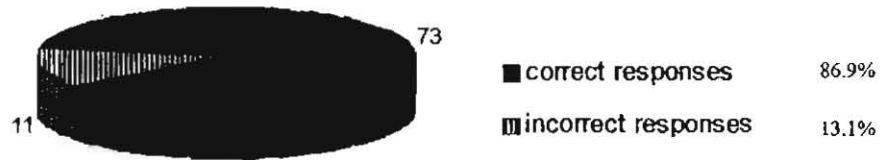


Diagram 27: Girls

Boys with teaching (n=84)
(12 of the 24 research subjects)

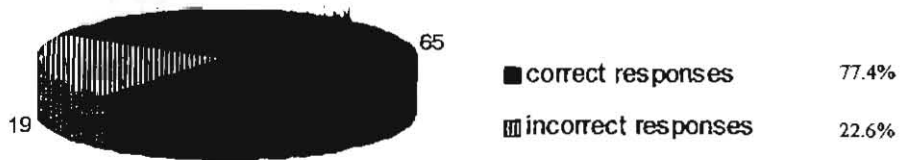


Diagram 28: Boys

Note that the girls perform better than the boys

4.3. Summary

The total sample's performance improved from 28-138 correct responses out of 168 possible responses, with teaching. The older half of the sample perform better, both before and after teaching. The English group perform better before and with teaching; the black language group improve to reflect performances almost as good as the English speakers; the Afrikaans speakers are the least positively effected with teaching. The middle class group perform best, before and with teaching; the lower class group improve to perform almost as well as the middle class group, with teaching; the working class group improve the least with teaching. There is a positive correlation between parent education level and performance, thus, the highest educated parents have children who perform best.

4.4. Tables: presentation of full results

Tables 2-11 (see Appendix B) reflect two sets of seven tasks: the initial performance results alternating with the subsequent, mediated performance results. In tables 2 and 3 data are arranged to indicate the differences between the older versus the younger half of the sample.

Table 4 and 5 rearrange the data to indicate the effects of language on performance.

Table 6 and 7 indicate the performance outcomes influenced by class.

Table 8 and 9 indicate how performance outcomes are influenced by parent education level.

Tables 10 and 11 reflect performance outcomes as influenced by gender.

4.5. Performance comparisons

First and second assessments

Total sample:

The total sample comprises twenty four subjects. Before teaching, one hundred and forty incorrect responses (83.3%) out of one hundred and sixty eight possible responses are given. Twenty eight correct responses are given (16.6%). The twenty four subjects, with learning and teaching, obtain thirty incorrect responses (17.9%) out of one hundred and sixty eight possible responses. One hundred and thirty eight correct responses (82%) are given. The performance of the total sample improves between the first and second task trials by 65.4%. This reflects an increase from 16.6% correct responses to 82% correct responses.

Age:

There are twelve older subjects and twelve younger subjects in the sample. Before teaching, the older subjects score sixty eight incorrect responses (81%) out of a possible eighty four responses. Sixteen of their responses (19%) are correct. The younger subjects, before teaching, score seventy two incorrect responses (86%) out of a possible eighty four responses. Twelve of their responses (14%) are correct. The research findings arranged according to age indicate an improvement of 67% between the first and second task trials for the older half of the sample. The younger half of the sample improve by 65% between the first and second task trials.

Language:

There are eighteen English first language speakers in the sample. Before teaching, one hundred and eight incorrect responses (81.2%) are given out of a possible one hundred and thirty three responses. Twenty five correct responses (18.8%) are given. There are four subjects who speak both English and Afrikaans. Before teaching, nineteen incorrect responses (90.48%) are given out of a possible twenty two responses. Two correct responses (9.52%) are given. There are two subjects who speak both English and an African language in the sample. Before teaching, thirteen incorrect responses (92.86%) out of a possible fourteen responses are given. One correct response (7.14%) is given. The eighteen English subjects, with teaching, score seventeen incorrect responses (12.78%) out of a possible one hundred and thirty three responses. One hundred and sixteen correct responses (87.22%) are given. The four English-Afrikaans subjects, with teaching, score eleven incorrect responses (52.38%) out of a possible twenty one responses. Ten correct responses (47.62%) are given. The two English-African language subjects, with teaching, score two incorrect responses (14.29%) out of a possible fourteen responses. Twelve correct responses (85.71%) are given. The English speaking subjects improve their performance by 68% between the initial and secondary task trials. The Afrikaans-English subjects improve their performance by 38% between the task trials. The Zulu/Xhosa subjects improve their performance by 79% between the initial and secondary task trials.

Class:

There are eighteen middle class subjects in the sample. Before teaching, one hundred and twenty one incorrect responses (83%) out of a possible one hundred and forty six responses are given. Twenty five correct responses (17%) are given.

There are four working class subjects in the sample. Before teaching, twenty five incorrect responses (89%) out of a possible twenty eight responses are given.

Three correct responses (11%) are given. There are two lower class subjects in the sample. Before teaching, thirteen incorrect responses (93%) out of a possible fourteen responses are given. One correct response (7%) is given. The eighteen

middle class subjects, with teaching, score fourteen incorrect responses (11%) out of a possible one hundred and twenty six responses. One hundred and twelve correct responses (89%) are given. The four working class subjects, with teaching, score fourteen incorrect responses (50%) out of a possible twenty eight responses.

A similar amount of correct responses are given. The two lower class subjects, with teaching, score two incorrect responses (14%) out of a possible fourteen

responses. Twelve correct responses (86%) are given. The middle class subjects improve their performance by 64% between the first and second task trials. The

working class subjects improve their performance by 39% between the task trials.

The lower class subjects improve their performance by 79% between the first and second task trials.

Parent Education Level:

Group A comprise four subjects whose parents have post-graduate qualifications. Before teaching, this group score seventeen incorrect responses (61%) out of a possible twenty eight responses. Eleven correct responses (39%) are given. Group B comprise eighteen subjects whose parents have some tertiary education, though not post-graduate qualifications. Before teaching, seventy six incorrect responses (78%) out of a possible ninety eight responses are given. Twenty two correct responses (22%) are given. Group C comprise six subjects whose parents have no tertiary education. Before teaching, thirty seven incorrect responses (88%) out of a possible forty two responses are given. Five correct responses (12%) are given. The four subjects in group A, with teaching, score one incorrect response (4%) out of a possible twenty eight responses. Twenty seven correct responses (96%) are given. The fourteen subjects in group B, with teaching, score twelve incorrect responses (12%) out of a possible ninety eight responses. Eighty six correct responses (88%) are given. The six subjects in group C, with teaching, score sixteen incorrect responses (40%) out of a possible forty two responses. Twenty six (60%) correct responses are given. The subjects of group A improve their performance by 57% between the first and second task trials. The subjects of group B improve their performance by 66% between the task trials. The subjects of group C improve their performance by 48% between the first and second task trials.

Gender:

There are twelve girls in the sample. Before teaching, sixty five incorrect responses (77.38%) out of a possible eighty four responses are given. Nineteen correct responses (22.62%) are given. There are twelve boys in the sample. Before teaching, sixty five incorrect responses (77.38%) out of a possible eighty four responses are given. Nineteen correct responses (22.62%) are given. The twelve girls, with teaching, score eleven incorrect responses (13.1%) out of a possible eighty four responses. Seventy three correct responses (86.9%) correct responses are given. The twelve boys, with teaching, score nineteen incorrect responses (22.62%) out of a possible eighty four responses. Sixty five correct responses (77.38%) are given. The girls in the research sample improve their performance by 64% between the first and second task trials. The boys improve their performance by 55% between the first and second task trials.

Summary

Learning and teaching are indicated as having a considerable impact on task performance. The English speakers from middle class backgrounds with well-educated parents (i.e. post-graduate qualifications) perform best; Age has little effect and gender seems to have no effect on performance.

4.6. Follow up questionnaires' data (cf. Appendix C)

The research subjects of the present project are now scattered in different schools. Three of the subjects remain at the pre-school in which the research tasks are carried out. The other subjects attend grade 1 at one of seven primary schools. One subject is currently living abroad: his address is unavailable and therefore no questionnaire data is available for this English speaking, middle class subject. The questionnaires, like the tables, make use of initials for both the subjects and their teachers. Two of the questionnaires are completed by the teachers themselves, as they are at the local schools; the other questionnaires are completed by the researcher, quoting the assessments and comments of the teachers, as per telephone interview. The following table summarises the follow up data. The original questionnaires are attached in Appendix C.

Key to Table 2 on following page

Age	O	older half of the class
	Y	younger half of the class
Language	E	English speakers
	E/A	Afrikaans / English speakers
	Z-X/E	Zulu or Xhosa/English speakers
Class	M	middle class
	W	working class
	L	lower class
Parent ed. level	A	children whose parents have post graduate qualifications
	B	children whose parents have tertiary education (not post graduate)
	C	children whose parents have no tertiary education
Gender	F	female
	M	male

- 1 in the table indicates 'good' academic performance
- 2 in the table indicates between 'good' and 'average' academic performance
- 3 in the table indicates 'average' academic performance
- 4 in the table indicates between 'average' and 'poor' academic performance
- 5 in the table indicates 'poor' academic performance

Subjects	Age	Language	Class	Parent education	Gender	Academic Performance
1. K.D.	O	E	M	B	F	1
2. M.G.	Y	E	M	B	F	
3. A.H.	Y	E	M	A	M	
4. J.H.	Y	E	M	A	M	
5. C.O.	O	E	M	B	F	
6. A.V.	O	E	M	B	F	
7. G.F.	Y	E	M	B	M	
8. C.T.	Y	E	M	B	F	2
9. S.P.	Y	E/A	W	C	M	3
10. R.F.	Y	E	M	A	F	
11. J.C.	O	E/A	M	B	M	
12. W.D.	O	E	W	B	F	
13. C.Pr.	O	E	M	A	M	
14. S.W.	O	E	M	B	F	
15. C.S.	Y	E	M	B	F	4
16. M.V.	O	E	M	B	M	
17. B.P.	Y	E	M	B	M	
18. C.P.	Y	E	M	B	M	
19. C.A.	Y	E/A	W	C	F	5
20. L.M.	O	Z-X/A	L	C	F	
21. O.N.	O	Z-X/A	L	C	M	
22. P.L.	O	E	M	B	M	
23. R.V.	O	E/A	W	C	M	

TABLE 2: FOLLOW UP DATA

The preceding diagrams and tables present a clear overview of the findings in order to facilitate the discussion in the following section.

SECTION 5. DISCUSSION

5.1. Introduction

The research is non-experimental: it aims to explore children's understanding of various tasks. The non-experimental nature of the present research is apparent in the unequal sized groupings, for example, there is a large middle class as opposed to lower class representation. Similar subdivisions are found for the language and parent education level analyses. Such skewed representation means that no definitive conclusions can be extracted from the findings, though one would hope to identify certain tendencies, which could then be taken further in future experimental research.

5.2. First and second performance data:

Total sample:

A small percentage of responses to tasks, performed without teacher mediation, are correct. This would seem to indicate that the task difficulty level is generally above the research subjects' developmental level, as anticipated when planning the research tasks. The correct response by some of the subjects may indicate that they are starting to reach the next level of developmental ability. Piaget refers to the innate mental structures initiating action on the external world (Richmond, 1970), reorganising themselves to experiences in order to adapt to present circumstances

(Craig, 1985; Macdonald, 1993), evolving through sequential stages, each with particular kinds of mental functioning. More particularly, the subject at the pre-operational level of development would not be expected to manage tasks involving reversibility or conservation of quantity eg. as in tasks 5 and 4 respectively. In contrast, as can be seen from the data on the second round of assessments, most subjects manage the tasks when the teacher guides them with prompts, according to their individual requirements. The overall improvement seems to indicate the importance of creating a ZPD for successful task performance, especially of those at a level slightly above the child's spontaneous level of functioning. (Vygotsky in Wertsch, 1985). Little time lapse between the first and second assessments imply that innate maturation accounts minimally, if at all, for the relative improvement between the two performance occasions.

Age:

The older subjects perform marginally better than their younger counterparts in the initial performance assessments, which would seem to corroborate Piaget's notion of innate maturation. However, as both groups improve about equally well with teaching i.e. teaching has a similar effect for both groups, one should take note of research such as Hyde's. Hyde (1970) says that it is learning and not age per se that accounts for performance potential. It could be argued that the age difference between the two groups is too slight to be able to make meaningful comparisons and that the discrepancy merely reflects individual differences. However, it is

argued that given the equal and directly comparable numbers in the two groups, the difference between them does warrant attention in future empirical studies.

Language:

The number of correct responses before teaching is approximately double the proportion for the English subjects as compared to the Afrikaans group and to the African language group, before teaching. The finding that the unilingual speakers do better than their bilingual counterparts, corresponds with other research on second language learning. Collinson (1974 in Wertsch, 1985) and Macdonald (1993) say that conceptual development in young children is negatively affected by education in a language other than the mother tongue. This is due to the fact that second language learning requires a qualitatively different kind of processing and thus a pre-school child's limited processing capacity is taken up with this function, leaving less capacity for the processing of other incoming information (Felix, 1975 in McLaughlin, 1982). Emotional factors may also impact on the performance of second language subjects. Alexander (1995 in Donald, Lazarus & Lolwana, 1997) refers to how children's self-concept may suffer if they are obliged to learn in a second language.

In the secondary task performance, the English subjects perform best, followed by the African language subjects and the Afrikaans subjects. Again, these findings indicate the importance of learning in the mother tongue, particularly at this young

age. A comparison of the first and second assessment results are particularly interesting. The Zulu/Xhosa group show the greatest performance improvement. This might be explained in terms of research that indicates that children who develop a good grasp of their own language first, are in a better position to learn a second language and to learn in the medium of a second language (Macdonald and Burroughs, 1991; Wertsch, 1985; Young & Schiebush, 1995). The subjects in the Zulu/Xhosa group only started to learn English at pre-school i.e. six months to a year prior to the present research. In contrast, the Afrikaans children were all conversant in English before pre-school, indicating that they learnt a second language at an earlier stage in their development than the children in the Zulu/Xhosa group. Thus, it is interesting to note that the children in the Afrikaans group fared worst during the task assessments.

The current findings in part confirm, but in part contradict Cummins and Swain (1986) who assert that “academic” performance and the length of time that an individual has had using a particular language should correlate. Again, no definitive conclusions can be drawn from the findings, as the language groups in this study are unequal in size and the overall sample is limited to twenty four subjects.

The influence of class on language:

Popkewitz (in Popkewitz & Tabachnik, 1981, p.162) refers to how culture is expressed in the individual’s language. As mentioned, class and ethnicity correlate

fairly closely in the present research sample. The term “culture” is understood here in terms of different ethnicity. Popkewitz says:

The social researcher, too, is a member of culture, mired in its history. His/her occupational language is drawn from the everyday world of practical experiences and commitments. The background assumptions sustained and developed in these patterns are “factual” constraints upon the social and moral constitution of the word.

The connection between the individual and her culture expressed in an individual’s language, is similar to Bakhtin’s (Wertsch, 1993) ideas expressed earlier.

However, Bakhtin refers to a multiplicity of speech genres. It could be argued that the language of the school is one such genre and as such is unfamiliar to all the children. Bernstein (Havighurst, 1976) refutes this unbiased position, saying that middle class children are at an advantage at school because they use a similar, elaborated form of English. Wertsch (1985) also argues that it is class bias that accounts for differential performance outcomes. The teacher’s middle class origins and teaching style is perceived as disadvantageous to subjects not from this socio-economic home background. The discrepancy between the relative performance of the working class subjects’ initial and mediated performances, underscore this theory. The working class subjects initially second best of the three groups, but after mediation their performance scores were the least successful. I would argue that what emerges from the above discussion is that the important issue concerns

the interrelationship between classroom participants. This is difficult to quantify, as individuals are more than their socio-economic class labels.

Class:

The eighteen middle class subjects initially perform best and the lower class subjects perform worst. These findings confirm theory which anticipates that tests would be biased in favour of the middle class subjects (Wertsch, 1985). Teaching results in the middle class subjects showing the greatest improvement and obtaining the best results. This finding corroborates Martini's (1995) finding that schools use a mediation style that is familiar to the middle class subject. The working class subjects seem to benefit the least from teaching.

Lewis (1966 in Havighurst, 1976) refers to a lack of educational aspiration in the lower classes. The lower class subject's good performance is unexpected in the light of the above theory. After teaching, the lower class subjects perform almost as well as their middle class counterparts, and certainly far better than the working class subjects. Although theory does not suggest any clear reason for this, it is surmised that the researcher's (in this study) awareness of theory on bias (Wertsch, 1985) may have led to an attempt to compensate for what was anticipated as being the weakest group.

Low educational aspiration associated with the lower classes in Lewis's research may not be altogether accurate in the more recent South African political context. More specifically, the children in the lower class group of the present study attend the school thanks to bursary opportunities. The fact that these pupils' parents have applied for such financial assistance, even at this early stage of their children's development, would seem to argue contrary to these theoretical findings, though only in terms of this very small sample. The relative success of the lower class subjects also seem to refute the findings reported by Wertsch (1985) that teacher and pupil bias disadvantage subjects other than middle class learners. The discrepancy between the lower class subjects' performance in relation to the working class subjects performance may best be explained by Havighurst (1976). He indicates that it is not only class, but also ethnicity that accounts for parental mediation style. The reference to parents is important, as they are their child's first teacher and the parents' initial teaching forms the foundation upon which all future learning is based. Again, it is not possible to reach a clear conclusion, as the number of subjects in each class is unequal.

Parent education level:

Group A performed better than group B, which in turn performed better than group C. This pattern is significant, being similar both before and after teaching. Although the A group perform better both before and after teaching, it is group B which shows the greatest performance improvement between assessments. The

trend apparent in these findings corroborate Feuerstein's (Wertsch, 1985) findings that less parent education is associated with a lack of awareness of the importance of consistent, early cognitive mediation. Levenstein (1988) discusses how children with parents who have not graduated from high school, are disadvantaged academically. Bee (1981) associates parent education level with their children's I.Q. The greatest improvement by the B group, may be particular to the specific sample used in the present research, as the subjects in the A group all have the potential advantage of non-working mothers. That is, mothers with more time (not just qualifications) for providing mediated learning for their children. No conclusive evidence can be stated, because of the small sample size and the unequal numbers of subjects in each of the subdivisions. However, the sequential nature of these results would tend to confirm previous research indicating the correlation between parent education level and their children's cognitive performance (Macdonald & Burroughs, 1991).

Gender:

Gender related findings of the initial assessments accord with Archer and Waterman's (1988) gender neutral research conclusions. However, Burnstein, Bank and Jarvik's (1980) assertion that males are more spatially competent and females more linguistically advanced, need to be considered, as the tasks used in the present research require both spatial and linguistic ability. This combination of language and spatial elements in tasks might mean that performances are

neutralised by each gender's relative strength and weakness. Traditional gender role stereotyping associated with the lower classes (i.e. the working and lower class designations in this study) and concomitant lower performance scores (Hoffman & Kloska, 1995; Nadelman, 1970) are not indicated in the present performance outcomes. In the secondary assessments, the girls perform marginally better than the boys. The reason for this is not apparent. The gender related data is particularly useful for comparative purposes, as the sample consists of equal numbers of girls and boys. However, the small sample size indicates that it is not possible to generalise the findings to other groups of children.

5.3. Follow up data:

The follow up data is useful in several ways. Overall, most of the follow up assessments done by the subjects' grade 1 teachers correlate closely with my research assessments. That is, both the researcher's assessments and in the follow up data indicate that the English speaking, middle class subjects, whose parents have tertiary education, are assessed as the best performers on academic type task; while second language, lower class subjects, usually with parents who have no tertiary education, perform worst. In comparing the second performance data of these subjects with the follow up data, the only discrepancies are, in most cases, associated with the negative impact of emotional immaturity (or, in 1 case to "dreaminess") or deficient English language skills. An interesting finding is that those subjects who are repeating another year at pre-primary school show

improved performance assessments. That is, they are assessed as being “average”, whereas their performances on the research tasks are “poor”, or “good” whereas I assessed this subject’s performances on the research tasks as “average”. This improvement in performance by the subjects still in pre-school contrasts with the data of the subjects now in grade 1, where teacher assessments tended to reflect a similar level to those of the researcher’s assessments. The finding that the researcher and the subsequent assessments of performance correlate, has several educational implications, which may be worth investigating in future empirical studies. One interesting observation, for example, is that all the subjects who do poorly on the research tasks and who, in the researcher’s professional opinion, were not school ready, are struggling in grade 1. If future empirical data emerges with similar findings, this data may be useful to parents when they are trying to decide whether their children should remain at pre-school or start formal schooling.

The follow up data indicate that the children from the bilingual groups of my research are progressing poorly in most cases (two of these six subjects are scored as “average”: one of these two is still in the pre-school and is having language enrichment with a speech therapist). Three of these subjects are not regarded as school ready, apart from their language limitations. Again, this data indicates the small number of subjects used in the present research, so that although implying

the importance of learning in one's mother tongue, can in no way be considered conclusive evidence.

SECTION 6. CONCLUSION

Before concluding, it must be noted that this is an exploratory study into children's grasp of reality. Moreover, a naturally occurring (i.e. non-experimental) heterogeneous group of pre-school children were used for the exploration. As such, the results presented in Section 4, as well as the discussion in Section 5, must be understood as merely highlighting tendencies which could be further investigated through controlled experimentation. Other constraints and criticism of this research project include teacher bias and limited sample size (see pages 48 – 49). Having thus focused attention on the explorative nature of the findings, I proceed with a summary of the main tendencies reported and discussed above.

Innate cognitive development forms an important baseline for mediation, which results in a similar improvement rate for the older and younger halves of the research sample. The results reported above indicate that unilingual subjects perform better than their bilingual peers, before and after teaching. It was observed that subjects who learned a second language (i.e. English) before their pre-school year, fared worse than those subjects who learned English at a slightly older age, i.e. during their pre-school education. Moreover, the findings indicate that pre-school children learn best in their home language. Children learning in a second language perform better if they learn the second language during the pre-school phase, rather than at an earlier time.

Language and class are closely associated, i.e. the middle class use an elaborated code of English, whereas the lower classes tend to use a restricted code. Schools tend to reflect a middle class approach. This may account for the reversal between the initial, spontaneous performance results and the secondary, mediated results where the middle class subjects performed best. The lower class subjects perform relatively well, suggesting that the more recent political changes in South Africa may be associated with increased motivation by previously disadvantaged groups. In the South African context of the recent past, class has been associated with ethnicity, by virtue of policies that advantaged some at the expense of others' socio-economic opportunities. It is argued that the effects of this segregation are still apparent in the current education system. Thus, the positive effects of motivation to learn by the lower class may be constrained by limited parent education level and by the fact that children from the lower classes (i.e. different ethnic groups) are obliged to learn in a second language in order to receive a "good" education. It is argued that these subjects are thus doubly disadvantaged.

The present findings clearly indicate that parent education level is associated with performance: the higher the parent education level, the better the subjects' performance scores tend to be. For example, subjects whose parents have post graduate qualifications fare considerably better than the subjects whose parents have no tertiary education. However, available time by parents for mediation may influence outcomes. Those subjects whose parents have post-graduate

qualifications often have non-working mothers, thus potentially available for mediation. This is implied in the finding that those subjects whose parents have some, though not post-graduate education, improve most with teacher mediation. Mediation, as judged by performance scores on the second assessment, appears to affect girls and boys in the present research sample equally. This finding supports research indicating gender neutral performance. However, the gender neutral findings may also indicate that gender specific characteristics eg. linguistic competence traditionally associated with females and spatial abilities traditionally associated with males, are balanced out in the research tasks, which requires both of these abilities.

The follow-up data echo the first and second performance data quite closely. This data particularly emphasizes the importance of first language learning. Emotional factors are also cited, by the subjects present teachers, as having an important effect on cognitive performance. An analysis of the data foregrounds the complex interrelationship between different factors in learning-teaching situations. For example, older children cope better with learning in a second language than do their younger counterparts.

Future empirical studies would do well to focus attention on the particular ways in which appropriate mediation can compensate for those subjects from home backgrounds incompatible with the typical demands of formal schooling

In conclusion, it is worth emphasizing that the common sense notion that heterogeneity would impact negatively on learning-teaching effectiveness, is contradicted by the present findings.

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Appendix A: research tasks

The first task is the egg and eggcup task. Six cardboard egg box pieces are used to represent eggcups and six corks are used to represent the eggs. This representation is explained to the children at the start of this activity. The children are asked to place one “egg” in each of the “eggcups”. They are then requested to take the “eggs” out of the “eggcups”. I then space out the “eggcups” and move the “eggs” close together. The children are asked to indicate where there are “more.”

The next task uses three differently shaped play dough “mountains”. These are placed on a dough board. Four, two dimensional cards, representing how the “mountains would be perceived from each side of the dough board, are placed flat on the table in front of the dough board. The children are asked to choose the card that represents the view of the mountain according to their own perspective. After this, a doll is placed at right angles to the children’s position. The children are now asked to choose the card that represents what the doll can see. The doll is moved to the other side of the dough board, as well as to the position opposite to that of the children. In each case, the children are asked to choose the corresponding card.

The third task involves two red and four blue plastic beads, placed on the table beside a bowl of multi-coloured plastic beads. The children are asked what they think the beads are made of (this is to ensure that they understand the concept of

“plastic”, used in this task’s question). The children are asked to say what they see (the two red and the four blue beads are indicated). The question posed is: “are there more blue beads or are there more plastic beads?”

In the next task, a large piece of play dough on a dough board is used. The children’s focus of direction is drawn to the dough by the instruction to look at it. The piece of dough is then divided into four similar sized balls, in the full view of the children. They are then asked “which is more, like this or like this?” (the two alternatives being indicated).

In the fifth task, a red, then yellow and finally, a blue bead is threaded onto a green piece of rope. The children are asked to indicate the colours of the beads (this is to check that their concept of colour is sound). The rope is moved into a toilet roll, so that a piece of the rope protrudes out of each end. The children are told that the “train” (the sequence of beads) is going into a “tunnel” (the toilet roll). The children observe this happening. The ends of the “tunnel” are then covered so that the beads are no longer visible. The children are asked to name the correct sequential appearance of the beads when they emerge from 1) the opposite side of the “tunnel” from the side where the beads went in, 2) the same side, 3) the toilet roll rotated 180 degrees and 4) from the toilet roll rotated 360 degrees.

The sixth task uses three similar looking yoghurt cups, one containing a little orange dye, the container placed in the middle remaining empty and the container

placed on the other side containing dark blue dye. The children are asked to say what they see. Then they are asked how they could get the orange dye into the blue dye container and the blue dye into the orange dye container, without mixing the colours together.

In the last task, two glass 3 litre mayonnaise bottles containing equal amounts of dyed water are placed next to one another. A perspex glass is also placed on the table. The children are asked to compare the liquid in the glass jars to see if there is the same amount in each of them. Once this has been agreed upon, the liquid in one of these containers is poured into the glass. The glass is placed beside the larger jar and the children are asked to comment on which container has “more”.

In the second application of the above tasks, the children were asked whether they remembered having done these tasks previously. A similar presentation format was used, but the children’s logic was questioned thoroughly as they proceeded, in order to provide guidance and to promote more focused thinking. It should be noted that the children perceive working on these tasks as a special opportunity to have the teacher’s undivided attention, and therefore see this “testing as a treat rather than as a “test”.

Appendix B: follow up questionnaires

Appendix B: tables

Eldest Subject		Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
1. O.N.		✓					
2. S.W.		✓					
3. A.V.		✓			(✓)		
4. K.D.							(✓)
5. P.L.						✓	
6. L.M.							
7. R.V.					✓	✓	
8. C.O.	(✓)				✓	✓	
9. M.V.							
10. C.Pr.		✓			✓	✓	
11. W.D.							
12. M.E.		✓				✓	
13. A.H.	(✓)			✓	✓	✓	✓
14. J.H.		✓			✓		
15. C.S.					✓		
16. M.G.				✓			
17. B.P.		✓	✓				
18. C.P.							
19. S.P.							
20. R.F.							
21. C.A.			✓				
22. J.C.							
23. G.F.							
24. C.T.							

Youngest Subject

TABLE 2 : FIRST PERFORMANCE DATA : AGE

C in the table indicates the subjects who struggle to concentrate during task performance.

G in the table indicates the subjects who appear to guess the correct answer to a task.

✓ in the table indicates the correct response is given to the task.

(✓) in the table indicates that the response given is almost 100%

Eldest Subject	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
1. ON	✓		✓	✓	✓	✓	✓
2. SW	✓	✓	✓	✓	✓	✓	✓
3. AV	✓	✓	✓	✓	✓	✓	✓
4. KD	✓	✓	✓	✓	✓	✓	✓
5. PL	✓	✓	✓	C	✓	✓	C
6. LM	✓		✓	✓	✓	✓	✓
7. RV	✓				✓	✓	
8. CO	✓	✓	✓		✓	✓	✓
9. MV	✓	✓	✓	✓	✓	✓	✓
10. CPr	✓	✓	✓	✓		✓	✓
11. WD	✓	G	✓		✓	✓	
12. MF	✓	✓	✓		✓	✓	✓
13. AH	✓	✓	✓	✓	✓	✓	✓
14. JH	✓	✓	✓	✓	✓	✓	✓
15. CS	✓		✓		✓	✓	
16. MG	✓	✓	✓	✓	✓	✓	✓
17. BP	✓	✓	✓	✓	✓	✓	✓
18. CP	✓	C	✓		✓	✓	✓
19. SP		✓	✓			✓	
20. RF	✓	✓	✓	✓	✓	✓	✓
21. CA	✓				✓	✓	
22. JC			✓	✓	✓	✓	
23. GF	✓	G	✓		✓	✓	✓
24. CT	✓	✓	✓		✓	✓	✓

Youngest Subject

TABLE 3 : SECOND PERFORMANCE DATA : AGE

C in the table indicates the subjects who struggle to concentrate during task performance.

G in the table indicates the subjects who appear to guess the correct answer to a task.

✓ in the table indicates the correct response is given to the task.

() in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
E							
1. A.V		✓			(✓)		
2. C.O	(✓)				✓		
3. C.T							
4. C.S							
5. J.H		✓			✓		
6. K.D							(✓)
7. M.G				✓			
8. R.F							
9. S.W		✓					
10. A.H	(✓)			✓	✓	✓	✓
11. B.P		✓	✓		(✓)		
12. C.P							
13. C.Pf		✓			✓	✓	
14. G.F							
15. M.V						(✓)	
16. P.L						✓	
17. M.E		✓				(✓)	
18. W.D							
E/A							
19. R.V					✓	✓	
20. S.P							
21. C.A			✓				
22. J.C							
Z-X/E							
23. O.N		✓					
24. L.M							

E = English Subjects
E/A = English and Afrikaans Subjects (bilingual)
Z-X/E = Zulu-Xhosa and English Subjects (bilingual)

TABLE 4 : FIRST PERFORMANCE DATA : LANGUAGE

C in the table indicates the subjects who struggle to concentrate during task performance.
 G in the table indicates the subjects who appear to guess the correct answer to a task.
 ✓ in the table indicates the correct response is given to the task.
 () in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
E							
1. A.V.	✓	✓	✓	✓	✓	✓	✓
2. C.O.	✓	✓	✓	✓	✓	✓	✓
3. G.I.	✓	✓	✓		✓	✓	✓
4. C.S.	✓		✓		✓	✓	
5. J.H.	✓	✓	✓	✓	✓	✓	✓
6. K.D.	✓	✓	✓	✓	✓	✓	✓
7. M.G.	✓	✓	✓	✓	✓	✓	✓
8. R.F.	✓	✓	✓	✓	✓	✓	✓
9. S.W.	✓	✓	✓	✓	✓	✓	✓
10. A.H.	✓	✓	✓	✓	✓	✓	✓
11. B.P.	✓	✓	✓	✓	✓	✓	✓
12. C.P.	✓	C	✓	✓	✓	✓	✓
13. C.Pr.	✓	✓	✓	✓	✓	✓	✓
14. G.F.	✓	G	✓		✓	✓	✓
15. M.V.	✓	✓	✓	✓	✓	✓	✓
16. P.L.	✓	✓	✓	C	✓	✓	C
17. M.E.	✓	✓	✓		✓	✓	✓
18. W.D.	✓	G	✓		✓	✓	
E/A							
19. R.V.	✓				✓	✓	
20. S.P.		✓	✓			✓	
21. C.A.	✓				✓	✓	
22. J.C.			✓	✓	✓	✓	
Z-X/E							
23. O.N.	✓		✓	✓	✓	✓	✓
24. L.M.	✓		✓	✓	✓	✓	✓

E = English Subjects
E/A = English and Afrikaans Subjects (bilingual)
Z-X/E = Zulu/Xhosa and English Subjects (bilingual)

TABLE 5 : SECOND PERFORMANCE DATA : LANGUAGE

C in the table indicates the subjects who struggle to concentrate during task performance.

G in the table indicates the subjects who appear to guess the correct answer to a task.

✓ in the table indicates the correct response is given to the task.

(✓) in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
M							
1. A.V.		✓			(✓)		
2. C.O.	(✓)				✓		
3. C.I.							
4. C.S.							
5. J.H.		✓			✓		
6. K.D.							(✓)
7. M.G.				✓			
8. R.F.							
9. S.W.		✓					
10. A.H.	(✓)			✓	✓	✓	✓
11. B.P.		✓	✓		(✓)		
12. C.P.						✓	
13. C.Pr.		✓			✓		
14. G.F.							
15. M.V.						(✓)	
16. P.L.						✓	
17. M.E.		✓				(✓)	
18. J.C.							
W							
19. R.V.					✓	✓	
20. S.P.							
21. C.A.			✓				
22. W.D.							
L							
23. I.M.							
24. O.N.		✓					

M = Middle Class Subjects
W = Working Class Subjects
L = Lower Class Subjects

TABLE 6 : FIRST PERFORMANCE DATA : CLASS

C in the table indicates the subjects who struggle to concentrate during task performance.

G in the table indicates the subjects who appear to guess the correct answer to a task.

✓ in the table indicates the correct response is given to the task.

(✓) in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
M							
1. A.V.	✓	✓	✓	✓	✓	✓	✓
2. C.O.	✓	✓	✓	✓	✓	✓	✓
3. C.I.	✓	✓	✓		✓	✓	✓
4. C.S.	✓		✓		✓	✓	
5. J.H.	✓	✓	✓	✓	✓	✓	✓
6. K.D.	✓	✓	✓	✓	✓	✓	✓
7. M.G.	✓	✓	✓	✓	✓	✓	✓
8. R.F.	✓	✓	✓	✓	✓	✓	✓
9. S.W.	✓	✓	✓	✓	✓	✓	✓
10. A.H.	✓	✓	✓	✓	✓	✓	✓
11. B.P.	✓	✓	✓	✓	✓	✓	✓
12. C.P.	✓	C	✓		✓	✓	✓
13. C.P.	✓	✓	✓	✓		✓	✓
14. G.F.	✓	G	✓		✓	✓	✓
15. M.V.	✓	✓	✓	✓	✓	✓	✓
16. P.L.	✓	✓	✓	C	✓	✓	C
17. M.E.	✓	✓	✓		✓	✓	✓
18. J.C.			✓	✓	✓	✓	
W							
19. R.V.	✓				✓	✓	
20. S.P.	✓	✓	✓			✓	
21. G.A.	✓				✓	✓	
22. W.D.	✓	G	✓		□	✓	
L							
23. L.M.	✓		✓	✓	✓	✓	✓
24. O.N.	✓		✓	✓	✓	✓	✓

M = Middle Class Subjects
W = Working Class Subjects
L = Lower Class Subjects

TABLE 7 : SECOND PERFORMANCE DATA : CLASS

C in the table indicates the subjects who struggle to concentrate during task performance.
 G in the table indicates the subjects who appear to guess the correct answer to a task.
 ✓ in the table indicates the correct response is given to the task.
 (✓) in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
A							
1. C.P.		✓			✓	✓	
2. R.F.							
3. J.H.		✓			✓	✓	
4. A.H.	✓			✓	✓	✓	✓
B							
5. A.V.		✓		✓	✓		
6. K.D.						✓	(✓)
7. M.E.		✓				✓	
8. C.T.						✓	
9. C.G.	✓				✓	✓	
10. P.L.						✓	
11. M.V.						✓	
12. G.F.							
13. S.W.		✓					
14. C.S.					✓	✓	
15. M.G.				✓		✓	
16. B.P.		✓	✓		✓		
17. C.P.						✓	
18. J.C.							
C							
19. S.P.						✓	
20. R.V.					✓		
21. C.A.			✓			✓	
22. W.D.							
23. L.M.							
24. O.N.		✓					

- A = Subjects with parents having 4+ years university education
 B = Subjects with parents having some tertiary education
 C = Subjects with parents having no tertiary education

TABLE 8 : FIRST PERFORMANCE DATA : PARENT EDUCATION LEVEL

C in the table indicates the subjects who struggle to concentrate during task performance.
 G in the table indicates the subjects who appear to guess the correct answer to a task.
 ✓ in the table indicates the correct response is given to the task.
 (✓) in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
A							
1. C.P.	✓	✓	✓	✓		✓	✓
2. R.F.	✓	✓	✓	✓	✓	✓	✓
3. J.H.	✓	✓	✓	✓	✓	✓	✓
4. A.H.	✓	✓	✓	✓	✓	✓	✓
B							
5. A.V.	✓	✓	✓	✓	✓	✓	✓
6. K.D.	✓	✓	✓	✓	✓	✓	✓
7. M.E.	✓	✓	✓	✓	✓	✓	✓
8. C.T.	✓	✓	✓		✓	✓	✓
9. C.O.	✓	✓	✓	✓	✓	✓	✓
10. P.L.	✓	✓	✓	C	✓	✓	C
11. M.V.	✓	✓	✓	✓	✓	✓	✓
12. G.F.	✓	G	✓		✓	✓	✓
13. S.W.	✓	✓	✓	✓	✓	✓	✓
14. C.S.	✓		✓		✓	✓	
15. M.G.	✓	✓	✓	✓	✓	✓	✓
16. B.P.	✓	✓	✓	✓	✓	✓	✓
17. C.P.	✓	C	✓		✓	✓	✓
18. J.C.			✓	✓	✓	✓	
C							
19. S.P.		✓	✓			✓	
20. R.V.	✓				✓	✓	
21. C.A.	✓				✓	✓	
22. W.D.	✓	G	✓		✓	✓	
23. J.M.	✓		✓	✓	✓	✓	✓
24. O.N.	✓		✓	✓	✓	✓	✓

- A = Subjects with parents having 4+ years of university education
 B = Subjects with parents having some university education
 C = Subjects with parents having no tertiary education

TABLE 9 : SECOND PERFORMANCE DATA : PARENT EDUCATION LEVEL

C in the table indicates the subjects who struggle to concentrate during task performance.
 G in the table indicates the subjects who appear to guess the correct answer to a task.
 ✓ in the table indicates the correct response is given to the task.
 (✓) in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
F							
1. A.V.		✓			(✓)		
2. C.O.	(✓)				✓		
3. C.A.			✓				
4. C.T.							
5. G.S.					✓		
6. J.H.		✓			✓		
7. K.D.							(✓)
8. L.M.							
9. M.G.				✓			
10. R.F.							
11. S.W.		✓					
12. W.D.							
M							
13. A.H.	✓			✓	✓	✓	✓
14. B.P.		✓	✓		(✓)		
15. C.P.							
16. C.P.		✓			✓	✓	
17. G.P.							
18. M.V.						(✓)	
19. M.E.		✓				(✓)	
20. O.N.		✓					
21. P.L.						✓	C
22. R.V.					✓	✓	
23. S.P.							
24. J.C.							

F = Female Subjects
M = Male Subjects

TABLE 10 : FIRST PERFORMANCE DATA : GENDER

C in the table indicates the subjects who struggle to concentrate during task performance.
G in the table indicates the subjects who appear to guess the correct answer to a task.
✓ in the table indicates the correct response is given to the task.
(✓) in the table indicates that the response given is almost 100%.

Subjects	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7
F							
1. A.V.	✓	✓	✓	✓	✓	✓	✓
2. C.O.	✓	✓	✓	✓	✓	✓	✓
3. C.A.	✓				✓	✓	
4. C.T.	✓	✓	✓		✓	✓	✓
5. C.S.	✓		✓		✓	✓	
6. J.H.	✓	✓	✓	✓	✓	✓	✓
7. K.D.	✓	✓	✓	✓	✓	✓	✓
8. L.M.	✓		✓		✓	✓	✓
9. M.G.	✓	✓	✓	✓	✓	✓	✓
10. R.F.	✓	✓	✓	✓	✓	✓	✓
11. S.W.	✓	✓	✓	✓	✓	✓	✓
12. W.D.	✓	G	✓		✓	✓	
M							
13. A.H.	✓	✓	✓	✓	✓	✓	✓
14. B.P.	✓	✓	✓	✓	✓	✓	✓
15. C.P.	✓	C	✓		✓	✓	✓
16. C.Pr.	✓	✓	✓	✓		✓	✓
17. G.T.	✓	G	✓		✓	✓	✓
18. M.V.	✓	✓	✓	✓	✓	✓	✓
19. M.E.	✓	✓	✓		✓	✓	✓
20. O.N.	✓		✓	✓	✓	✓	✓
21. P.L.	✓	✓	✓	C	✓	✓	C
22. R.V.	✓				✓	✓	
23. S.P.		✓	✓			✓	
24. J.C.			✓	✓	✓	✓	

F = Female Subjects
M = Male Subjects

TABLE 11 : SECOND PERFORMANCE DATA : GENDER

C in the table indicates the subjects who struggle to concentrate during task performance.

G in the table indicates the subjects who appear to guess the correct answer to a task.

✓ in the table indicates the correct response is given to the task.

(✓) in the table indicates that the response given is almost 100%

Appendix C: follow up questionnaires

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear J, L & O.

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. C.A.			✓	U. weak in all areas.
2. K.D.	✓			Lovely!
3. M.G.	✓			But slow with written work.
4. R.H.	✓			Hard worker
5. J.H.	✓			works hard.
6. L.M.			✓	Very untidy - poor language.
7. O.N.			✓	Poor language - average marks.
8. C.O.	✓			Lovely!
9. S.P.		✓		Hard worker
10. C.S.			✓	She tries hard - average reading, maths.
11. C.T.		✓		Works well
12. M.V.			✓	Needs help often.

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear *S + E.*

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. J. C.		✓		<i>Group participation weak. prefers to work with friend. Is receiving language stimulation.</i>
2. W. D.		✓		—
3. F. M.	✓			<i>Gustav copes well in all areas and thrives on being given challenges.</i>

Many thanks in anticipation of your prompt co-operation.

Frances.

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear *Mrs P.*

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. R.F.		✓		<i>fine motor co-ordination needs help. she can be rather dreamy.</i>
2. A.V.	✓			<i>excellent in all areas.</i>

Both children are very motivated to tackle tasks.

Many thanks in anticipation of your prompt co-operation.

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear *Mrs B*:

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. B.P.			✓	<i>emotionally immature</i>
2. C.P.			✓	<i>emotionally immature</i>

Many thanks in anticipation of your prompt co-operation.

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear *L.*

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. <i>C. Pr.</i>		✓		—

Many thanks in anticipation of your prompt co-operation.

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear *H.*

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. <i>P.L.</i>			✓	<i>emotionally immature; says "I can't" and won't try activities.</i>

Many thanks in anticipation of your prompt co-operation.

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear *Mrs R.*

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. <i>R.V.</i>			✓	<i>slow.</i>

Many thanks in anticipation of your prompt co-operation.

Frances Hill

University of Cape Town

Supervisor: Dr. Anita Craig

Course: M.Phil. in Education Support

August, 1998.

Dear *Mrs M.*

I am currently completing my masters degree dissertation at U.C.T. I am specifically interested in the current academic status of my 1997 pupils in comparison to their classmates. In this regard, I would be most grateful to you for completing the following table. Please mark the appropriate column(s) and note any relevant comments.

<u>Name of pupil</u>	<u>Academic performance is:</u>			<u>Comments</u>
	<u>Good</u>	<u>Average</u>	<u>Poor</u>	
1. <i>S.W.</i>		✓		<i>starting to "come out of her shell" now.</i>

Many thanks in anticipation of your prompt co-operation.