

**Student success in an introductory engineering course
An investigation of approach to learning and
cultural capital**

By

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Abstract

The construct of approach to learning has proved to be powerful in explaining differences in students' experiences of learning in higher education. However this construct does not explain the impact that students' socio-economic background has on their experiences of higher education. For this reason, the construct of cultural capital that is widely used in the sociology of education literature was used in an attempt to explain the differences experienced by students from various social classes.

Data of this study were collected through individual in-depth interviews with each of ten purposefully selected students. Students' approaches to learning were identified for both early and later in the course. A majority of students' approaches shifted from the use of a deep approach to a strategic approach. However, in terms of success in the course, the construct of approach to learning was limited in explaining why some students failed while others were successful in the course. Cultural capital better explained why these differences in performance occurred, and it further emphasized the importance of taking into account the different forms of cultural capital that students bring into higher education.

This study has two main implications: firstly, it supports the promotion of deep approach to learning, however, a caution about the students workload should be taken as this might unintentionally promote the use of surface approach. Secondly, the results regarding cultural capital showed that students come from varying backgrounds. This implies that assessment should take this into account and should aim to be explicit in all demands.

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Chapter 1

Introduction

1.1. Background

For many years, there has been a concern about the high failure rates experienced by first year university students. These failure rates have been explained by students' transition from high school into higher education institutions, under-preparedness in certain courses, and inappropriate approaches to learning. In the South African context this challenge is perpetuated by our history, which includes many years of economic divides and inequalities between the various races and social classes.

In South Africa, recent unprecedented economic growth has elevated the demand for engineers. In order to meet the growing demand for engineers, South African higher education institutions must increase their throughput of high quality engineers¹. This implies that more effort must be put into addressing the difficulties faced by first year engineering students in order to reduce the drop out rates at the first year level and to retain them in their subsequent years of study.

At the University of Cape Town, the Faculty of Engineering and the Built Environment has put introductory courses for each discipline in place. The purpose of these introductory courses is to introduce first year students to the discipline and to prepare them for what lies ahead in future years. One example of these introductory courses is the chemical engineering 1 course, hereafter termed 'the course'. In broad terms, this course aims to introduce the students to the profession of chemical engineering, to facilitate students' transition between school and the university, and finally, to prepare them for the subsequent years of their chemical engineering undergraduate studies. This course forms the context of this research and further details regarding the course context are provided below.

¹ ASGISA 2006 Annual Report found at <http://www.info.gov.za/ASGISA/>

1.2. The context of the study

The course aims to lay a foundation for the discipline of chemical engineering, and to assist students with their induction into the profession. The course outcomes consist of conceptual development, modelling and computing skills, personal development and career development.

Conceptual development focuses on developing fundamental chemical engineering concepts such as material and energy balances. Modelling and computing allows students to learn how to solve simple to more challenging chemical engineering problems. Personal development and career development involves tasks such as developing a curriculum vitae, plant visits, and an 'email an engineer' project, in which each student is required to consult an engineer in industry by email to broaden their understanding of the workplace.

Teaching in this course takes place during four lectures per week, with each lasting for forty-five minutes. Teaching strategies are designed with the aim of getting students to actively engage with the concepts. The lecturers allow students time to try the course problems by themselves, discuss issues with their peers and report back to the class on what they have learned. The lecturers then clarify material with which students are grappling. Students are also reminded that they have to continue to work on their own beyond the lecture period. In addition to lecture time, students have a set of weekly tutorials and homework assignments. During the tutorial afternoon, students are required to work in small groups to solve a set of problems. Homework assignments are set for individual students to practise basic calculations during the weekend. In addition to mastering these calculations, a recent intervention, Part B of the homework assignment, was introduced. The primary purpose of this Part B is to allow students to reflect on the concepts they had learned and this involved asking questions that started with 'what if', 'explain...' and 'why do you think...?'.

Assessment in the course takes place in the form of assignments, tests, projects and one final examination at the end of the year. The assessment tasks evaluate students' knowledge and application of the fundamental concepts. The testing of these fundamental concepts is often done in the form of real life problems given to students. These often involve relatively dense text that aims to contextualize the problem. The most recent assessment intervention is a book review, in which each student is required to read a book of their choice during the June-July holidays and write a report on it. Most of these tasks require students to have good reading, interpretation and writing skills. This is an indication that although reading and writing skills are not explicitly taught in the course context, they are implicitly valued.

The Department of Chemical Engineering sees this course as an access to the rest of the discipline and it is for this reason that this course has been taken as the context of this study, with the belief that it has an important influence on the subsequent year of the student's undergraduate studies.

1.3. Motivation for the study

Although this course intends to introduce students to the discipline, it continues to produce a failure rate of about 30-40%. The high failure rate is mainly among students who come from previously disadvantaged² backgrounds. Although student learning research has been conducted in the department in previous years, this body of research has not looked at the impact that these students' backgrounds have on their success in this course.

A comparison of the performance of students from ex-DET³ and multiracial schools in the course was carried out and the results are presented in figure 1-1. In general, the findings of this comparison suggest that there are inequalities in success between students who have attended ex-DET schools

² Previously disadvantaged backgrounds refer to backgrounds resulting from the apartheid era.

³ Ex-DET refers to the apartheid category of schools, which were designated for black people only.

and those who attended multiracial schools. Students from ex-DET schools tend to perform poorer than their multiracial school counterparts.

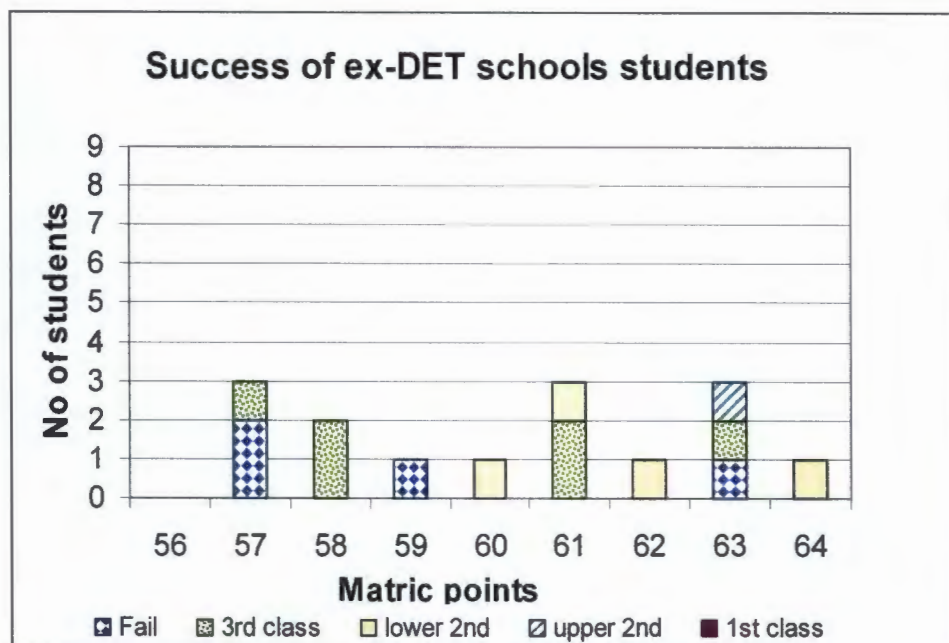
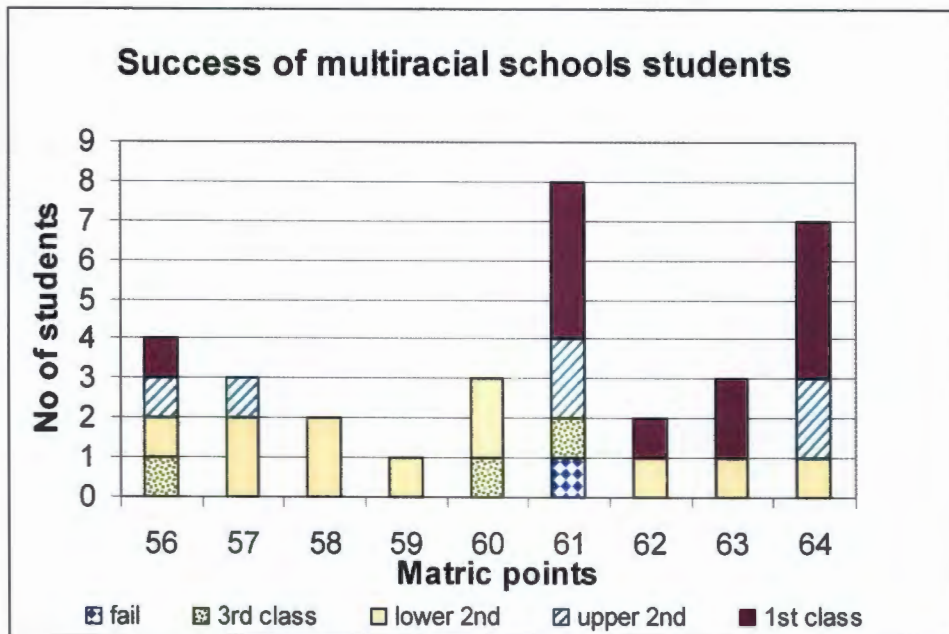


Figure 1-1: A comparison of students' performances with the same matric points

The effects of the former apartheid era still prevail in the South African educational system. When one looks closely at this data presented in figure 1-1, one can observe that an average student from multiracial school passed the course with an upper second, while their counterpart from ex-DET school

passed with a third class pass. In Figure 1-1, when one looks at the number of students who got first class passes, none of them are from ex-DET school; the highest grade achieved by an ex-DET student was an upper second, which was achieved by only one student. The question then becomes, if these students were admitted into the engineering programme and all had good chances of success, why is it that a student from an ex-DET school is performing very poorly when compared to their multiracial counterpart? What really is the explanation behind this big difference? All the students represented in Figure 1-1 came with matric points⁴ between 56 and 64, which imply that they were all at the very top of their classes where they came from. But then why are the ones coming from multiracial schools performing much better than the others?

The broad purpose of this study is to start to develop an explanation for students' success in the course using interviews with a purposively selected group of students.

1.4. Outline of the thesis

This chapter has provided the essential background, context and motivation to this study. The two theoretical constructs have already been mentioned in passing. The rest of the thesis is outlined as follows:

Chapter 2 provides a review of relevant literature regarding the theoretical constructs governing this study. The key theoretical constructs are the approach to learning and cultural capital and both the theoretical and empirical aspects of these constructs are covered in this chapter. The chapter concludes with a formulation of specific research questions.

Chapter 3 covers issues regarding the methodology of this study. Epistemological position and choice of a research paradigm are discussed to provide justification of the methods adopted in collecting and analyzing data.

⁴ Matric points is a system used by universities in South Africa to give a single score to students for admission purposes.

Chapter 4 which provides the actual details of the methods used in collecting and analyzing the data, also provides an examination of the position of the researcher and finally introduces the reader to the interviewees.

Chapters 5 and 6 are the heart of this thesis. They cover interview findings on students' approaches to learning and cultural capital respectively.

Chapter 7 provides the general discussion, which draws on the literature presented in Chapter 2. This will be followed by the implications of the results and a conclusion of the thesis.

Chapter 2

Literature review

2.1. Introduction

The broad objective of the present study was to investigate the applicability of two well-known theoretical constructs in explaining students' success in a first year engineering course. The two constructs are approach to learning and cultural capital. The purpose of this chapter is to review the literature available on these two constructs, to describe ways in which they have been used in educational research and to provide a critical assessment.

2.2. Approach to learning

The construct of approach to learning was established in the study by Marton and Säljö (1976a; 1976b) at the University of Gothenburg in Sweden. They investigated the processing of information by university students, focusing on '*what* the students learn' rather than previous studies in cognitive psychology which had emphasized '*how much* they learn' (Marton & Säljö, 1976a, p. 4). Students were asked to read a piece of academic text, after which they would be asked questions regarding the content of what they had read. Marton and Säljö identified two groups of students: those who engaged in what they termed 'deep-level processing' and those who engaged in 'surface-level processing'. The group that engaged in deep-level processing had grasped the *meaning* the authors intended to convey and focused on the conclusions that the authors drew from the evidence they had provided. The group that engaged in surface-level processing focused on *describing* parts of the text alone without an understanding of the purpose of the article. Later on, the term 'approach to learning', which includes an intentional component, was adopted instead of the more narrow 'level of processing' which had been derived from information processing theory (Marton & Säljö, 1984). Much research into approaches to learning continued after this study. A brief review of these studies follows below.

The student learning research literature cites many studies conducted on students' approaches to learning following the Marton and Säljö (1976a; 1976b) studies. The study conducted by Entwistle and Ramsden (1983) asked students to reflect on what they usually did in their studies in general rather than focusing on their approaches while tackling a particular task. They used the Approach to Studying Inventory (ASI) which they designed and administered to a large number of students in a higher education context. Based on the results of the ASI and the follow-up interviews, they formulated four 'learning orientations', which are: the meaning orientation, the reproducing orientation, the strategic orientation and the non-academic orientation. The meaning and reproducing orientation are equivalent to the deep and surface approaches, while the strategic orientation involves the intention to use either a deep or a surface approach to maximize marks in any way necessary. The non-academic orientation involves a passive surface approach, with little interest in academic aspirations, paying little attention to details and assembling irrelevant and disordered facts (Entwistle & Ramsden, 1983). In a parallel but unrelated study, Biggs (1987) produced very similar results to those of Entwistle and Ramsden (1983) with his Study Processes Questionnaire (SPQ). Biggs identified three dimensions: the internalizing (similar to deep approach), the utilizing (surface approach) and the achieving (strategic approach) dimensions.

Perhaps it is important at this stage to look closely at what Entwistle and Ramsden (1983) meant by a *strategic approach*. Entwistle and Ramsden mentioned that students with strategic approaches had 'an apparent readiness to adopt either deep or surface approaches', and that these students 'will seek high grades, using meaningful or rote learning, whichever seems to produce the best results' (Entwistle & Ramsden, 1983, p. 49). Similarly, Biggs (1987) termed this orientation the 'achieving orientation', in which a student uses an achieving motive to obtain the highest grades, regardless of whether the material is interesting or not.

2.2.1. Influence of the context

The most influential work for the present study was the work by Paul Ramsden on how approaches to learning are influenced by the learning context. In his book *Learning to Teach in Higher Education*, Ramsden (2003) addresses the interconnectedness of students' perceptions of the learning context and their approaches to learning by stating that:

Perceptions of assessment requirements, of workload, of the effectiveness of teaching and the commitment of teachers, and of the amount of control students might exert over their own learning, influence the deployment of different approaches, which are very clearly adaptive responses to the educational environments defined by teachers and courses.

(Ramsden, 2003, p. 81)

Ramsden brought the above ideas together and represented them in Figure 2-1 in which he outlined the interactions between context, approaches to learning and learning outcomes. Ramsden points out that a student's learning outcome can be traced back to their approach to learning, which is derived from an interaction between their orientations to studying and their context of learning and that this is based on their perception of the context.

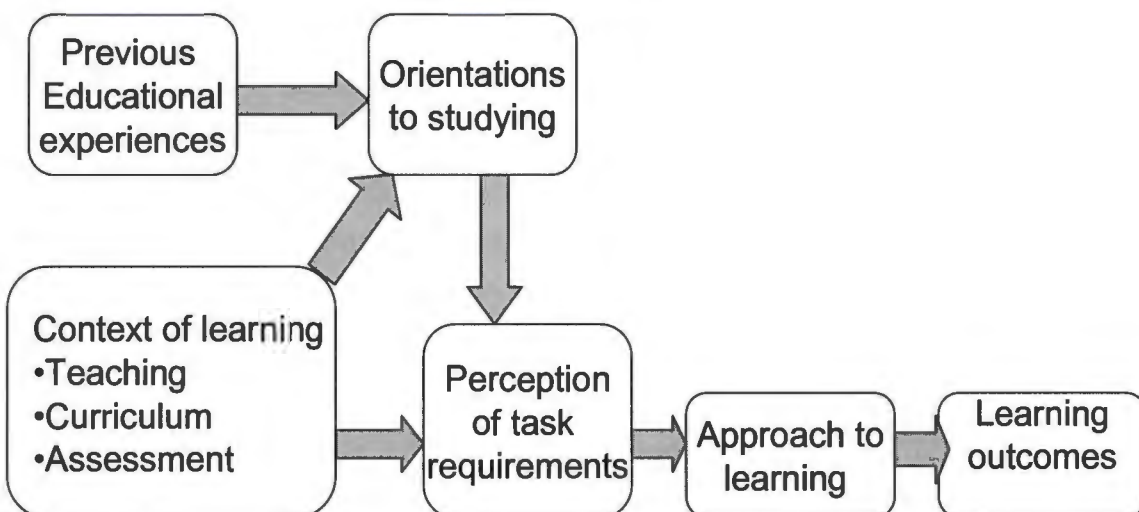


Figure 2-1: A model of student learning in context (Ramsden, 2003, p. 82)

He further asserts that this diagram is 'heuristic' and not 'deterministic' and that it must be used as a guideline to reason about possible relations between different aspects of learning and teaching. Ramsden's model is very similar to

Biggs' 3P model of student learning (version given in Biggs, 1999). The 3P model describes three points in time in which learning-related factors are placed: presage, before learning takes place; process, during learning; and product, the outcome of learning (hence the 3P model). However, Biggs suggests that one should look at this model as an open system, where the disturbance or change to a part of it affects the entire system, until a new steady state is attained.

The study conducted by Case and Gunstone (2003) with second year chemical engineering students supports Ramsden's model of students perception of the learning context, but the study further emphasizes the importance of students' perception of time. They found that all students were conscious of time pressure, but those using a deep approach still managed to allocate time to develop understanding.

2.2.2. Critical assessment of the approach to learning theory

Haggis (2003) presented a 'critical investigation' into the field of 'approaches to learning' research. Her main concern is the 'surprising lack of critique in relation to both the concepts and their widespread use' (p 90). Haggis's major critique revolves around the way the construct of approach to learning is used as if representing the 'truth', with studies using this construct attempting 'to replicate or extend basic ideas that are seen to have already been established' (Haggis, 2003, p. 90). She argued that attempts to apply this construct in various cultural contexts have proved to contradict its fundamental assumptions. However, there is still a tendency to see the findings of this construct as truth 'beyond the constructive powers of cultural context' (Haggis, 2003, p. 93). Haggis then explores research in the area of academic literacies as an alternative approach to understanding student learning and suggests that higher education has to come up with alternatives to the construct of approach to learning. Other notable critical engagements with this theory were earlier presented by Webb (1997) and Malcolm and Zukas (2001) who criticized the overly cognitive perspective of the theory as opposed to socio-cultural perspectives on learning.

In their response to Haggis, Marshall and Case (2005) argue that the misinterpretation of the construct in literature is not a reason to entirely discard it as suggested by Haggis. They suggest that 'key features of the construct be asserted and that research approaches true to the construct be encouraged' (p. 258), but they also agree with Haggis that incorporation of other theoretical perspectives would be appropriate.

Now that the construct of an approach to learning and the use of inventories to identify it have been reviewed, the next section outlines the second construct in this study - the construct of cultural capital.

2.3. Cultural capital

The French sociologist, Pierre Bourdieu, is well known in sociology of education for his theory of cultural capital, which states that upper class children are privileged in the educational system because their families possess the cultural knowledge and the language skills valued by the dominant social class.

The notion of cultural capital encompasses 'a broad array of linguistic competencies, manners, preferences, and orientations' (Reay, 2004, p. 74), which Bourdieu terms 'subtle forms of the trick (*ruse*) of social reason according to which the academic system works objectively towards *the reproduction of the structure of relations between the sections of the dominant classes*' (Bourdieu, 1977, p. 504). He identified three variants of cultural capital: the embodied state, the objectified state and the institutionalized state. The embodied state includes general cultural awareness, verbal skills and taste for what is considered 'high art'; the accumulation of this form of cultural capital begins in early childhood and it requires 'investment of time by parents, other family members or hired professionals to sensitize the child to cultural distinctions.' (Reay, 2004, pp. 74-75). The objectified state refers to material objects such as books, artefacts, dictionaries, paintings or other instruments which require embodied cultural capital to be appreciated fully. The institutionalized state refers to educational credentials, such as degrees from prestigious universities.

Bourdieu argued that cultural capital is unequally distributed in society, with upper class families possessing more compared to working class families. It is transmitted in the home from a very early age and there are clear differences in its possession by the time the children start school. He argued that at schools, social class inequalities continue because the educational system, which may appear to be *meritocratic* on the surface, actually perpetuates and exacerbates the existing inequalities because of its hidden value system that privileges individuals from higher status backgrounds.

By doing away with giving explicitly to everyone what it implicitly demands of everyone, *the educational system demands of everyone alike that they have what it does not give*. This consists mainly of linguistic and cultural competence and that relationship of familiarity with culture which can only be produced by family upbringing when it transmits the dominant culture.

(Bourdieu, 1977, p. 494, *emphasis added*)

Instead of rewarding and promoting students only according to their ability, schools and teachers are biased in favour of students who possess the 'right' kind of cultural capital (Dumais, 2006).

For more than 20 years, sociologists have studied cultural capital and its effects on educational outcomes, both quantitatively and qualitatively. However, the findings from these studies have been mixed with no consistent operationalisation of the main concepts, leading some to conclude that Bourdieu's theory of cultural capital may not be fruitful in explaining the social inequalities in the educational system (Lareau & Weininger, 2003). Nevertheless this theory remains a popular construct for explaining the inequalities in the educational system because it recognizes that there are many dimensions underlying students' achievement.

In their critical assessment of the cultural capital literature, Lareau and Weininger (2003) argue that a dominant interpretation of cultural capital rests on two different conceptions. The first conception of cultural capital is assumed to denote knowledge of or competence with 'highbrow' aesthetic culture such as fine art and classical music. The second conception of cultural capital avoids the notion of 'highbrow' aesthetic culture, but conceptualizes cultural capital in terms of informal academic standards by which teachers reward more general skills, habits and styles. Both of these interpretations are explored below, with empirical studies discussed within each category.

2.3.1. Cultural capital as knowledge of 'highbrow' aesthetic culture

The conceptualisation of cultural capital as participation in highbrow aesthetic culture in education can be traced back to the work of Paul DiMaggio in the early 1980s, and in particular, his 1982 article on the relation between cultural capital and school success. During that time, he argued that 'conventional measures of family background fail to capture those cultural elements of status that make a difference in school interactions' (DiMaggio, 1982, p. 189). His conception of cultural capital as 'specific distinctive cultural traits, tastes, and styles' (p. 189) of individuals who share conventions was influenced by Bourdieu's (1977) statement that defined cultural capital as 'instruments of the appropriation of the dominant culture' which socially designated as worthy of being sought and possessed. It is this statement that has led DiMaggio and subsequently many others to use 'highbrow' aesthetic culture as a way of looking at cultural capital.

DiMaggio (1982) then operationalised cultural capital indirectly through a measure of attitudes towards participation in high-status cultural activities such as attendance of arts, concerts and performances. His assumption is that any net association between cultural capital and students' grades is explained by the tendencies of teachers to 'communicate more easily with students who participate in elite status cultures, give them more attention and special

assistance, and perceive them as more intelligent and gifted than students who lack cultural capital' (DiMaggio, 1982, p. 190).

According to Lareau and Weininger (2003), this work of Paul DiMaggio set the stage for much of the existing UK literature on cultural capital. Many studies conceptualized cultural capital as participation in high-brow cultural activities and examples of these studies are: DiMaggio and Mohr (1985) where cultural capital is measured as students' attitudes or interest towards art, music, performance and literature; Kalmijn and Kraaykamp (1996) where cultural capital is measured as parents' attendance of plays and performances, classical music, and art museums and lastly, Eitle and Eitle (2002) where cultural capital is measured as trips to museums, art, music and dance classes. The common feature of all these studies is the focus on high status cultural activities, which the authors endeavour to relate to educational attainment.

2.3.2. The broader interpretation of cultural capital

The second interpretation of cultural capital differs from the first view in that it does not see cultural capital as 'highbrow' culture. Studies conducted under this interpretation cover different topics and seek to answer different questions. This has led to a wide range of understandings of cultural capital, highlighting the difficulty in producing a single coherent definition. These authors can be seen to explore tacit areas of Bourdieu's concept as opposed to constructing new interpretations from it. This conceptualization stresses that there are 'micro-interactional processes through which individuals comply (or fail to comply) with the evaluative standards of the dominant institutions such as schools.' (Lareau & Weininger, 2003, p. 568). Lareau and Weininger's (2003) definition of cultural capital emphasizes Bourdieu's reference to the capacity of the dominant class to 'impose' advantageous standards of evaluation on the educational system. Lareau and Weininger assert that Bourdieu's explanation of cultural capital in terms of 'imposed educational norms of the dominant social class' is one that recurs throughout his work, and is thus the core of cultural capital.

Lareau and Weininger (2003) agree that this account of cultural capital is very abstract; hence its use assumes empirical documentation of particular evaluative criteria. They mention two important components: firstly, studies that take this perspective must identify the particular expectations – both formal and especially informal – by means of which educators evaluate students. Secondly, the researcher must document students' and parents' ability to meet the standards held by educators. This is as a result of students' and parents' 'dispositional skills and knowledge that differentially facilitate or impede their ability to conform to institutionalized expectations.' (Lareau & Weininger, 2003, p. 588). Different studies explore this view of cultural capital as micro-interactional processes; these are given below.

Cultural capital as 'parental interactions' in education

McDonough (1996) uses the concept of cultural capital in her study of students' college choice in the USA. She takes on a similar definition to Lamont and Lareau (1988) that cultural capital is the widely shared. According to McDonough, class status operates indirectly in students' choice of college through its impact on academic results, and directly through individual choice where socioeconomic status effects are mediated, in part, by parents' knowledge of what it takes to prepare for college. She emphasises that parents transmit cultural capital by informing their children of the value of, and process for securing a college education, and its potential for conversion in the working world. For McDonough, cultural capital comprises the 'first-hand' knowledge that parents have of the college admission processes, detailed understanding of SAT scores and possibility of raising them through tutoring, availability of private college counsellors as well the initiative to secure private tutoring. It is important to note that all this very useful knowledge that is passed on by parents to their children is not taught at school level.

By contrast, another study conducted by Lareau and Horvat (1999) in the United States investigated the involvement of parents in their children's learning. In particular, cultural capital includes parents' large vocabularies, sense of entitlement to interact with teachers as equals, time, transportation,

and childcare arrangements to attend school events during the school day. In other words, parents' compliance with the institutional requirements and parents' involvement in activating the 'right' cultural capital in their children can be seen as one way in which social exclusion continues to be perpetuated.

In a similar case study, Reay (2004) argued that the growth of policy initiatives that accentuate the role of parents in schooling have made the workings of cultural capital in relation to education more visible. She states that 'Within government policy parental involvement has become the means whereby schools can tap the cultural capital resources of parents in the drive to raise standards' (Reay, 2004, p. 73). Parental involvement and parental choice of gifted/talented programs at schools continue to award educational advantage to those students of elite parents as opposed to those of other working-class parents. She also cautions that while it is important to have a clear focus on the standards that policymakers, schools and teachers use to evaluate students and their parents, it is also vital to avoid any uncritical acceptance of such standards.

These studies may have focused on different aspects or used cultural capital at different points, however, they have all pointed out the role that parents play in complying with or failing to comply with the institutional standards. It becomes evident that different forms of cultural capital exist and are required in different contexts, and that parents play important roles in activating the 'required' cultural capital for the sake of their children.

Cultural capital at home – Reading and media

Other studies have argued that participation in certain cultural activities does lead to academic success. For example, De Graaf, De Graaf and Kraaykamp (2000) found that reading is associated with academic success, and infer from this that the effect of cultural capital on educational attainment is due to the 'educative resources' such as analytical and cognitive skills which are developed by reading. In her study that argues that both the 'highbrow' and the other forms of interpreting cultural capital co-exist, Sullivan (2001) agrees

with De Graaf et al. (2000) that activities such as reading may lead to development of knowledge or skills. In addressing reading, she looked at the types and amount of books and newspapers read. In addition to reading, Sullivan (2001) also found factual television programs on science, arts and humanities are associated with these skills; however, she does not imply that reading or watching sophisticated television programs fosters educational achievement.

Bourdieu's theory has been criticized because of the lack of empirical evidence to support it (Lareau & Weininger, 2003). He is criticized for not being precise enough about exactly which resources associated with the middle-class home form cultural capital, and how these resources are converted to educational qualifications. Although cultural capital theory recognizes the multi-causal approach to understanding complexities of achievement, it has become very difficult for researchers to distinguish the relative importance and influence of particular cultural factors.

2.4. Conceptual framework for the study

In this study, both the approach to learning literature and some aspects of the cultural capital literature have been drawn upon; specifically, this study draws from the broad interpretation of cultural capital.

However, I deviate from Bourdieu's view that one can have 'more' or 'less' cultural capital because educational institutions may not be the only places where cultural capital is valued. Cultural capital that someone has may be appropriate in one context but not in other contexts. For this reason, I operationalise cultural capital as 'aligned' and 'non-aligned'. This way of looking at cultural capital suggests that there is no simple measure of 'more' or 'less' of cultural capital, but there are different forms which may be required in different contexts.

Now that the theoretical aspects of this study have been laid down, specific research questions that this study aims to address are given below:

1. What approach to learning is the student using at the beginning and towards the end of the course (and is there a change)?
2. Does an approach to learning explain student's success in the course?
3. What type of cultural capital did the student bring to university?
4. Does cultural capital explain student's success in the course?

In order to address these questions, the methods of data collection and analysis must be justified. The purpose of the next chapter is to address issues of methodology and epistemological positioning of the present study.

Chapter 3

Research methodology

3.1. Introduction

In conducting research, there are two important questions to which one needs to apply considerable effort to answer. Firstly, what methods should be employed in the research? Secondly, how is the choice of these methods justified? The answer to the first question lies in the nature of research questions and the objectives of the research. Given that the aim of this research is to explore the usefulness of students' approaches to learning and their cultural capital in explaining their success, a qualitative methodology would seem an obvious choice. However, many people (Cohen, Manion, & Morrison, 2001; Crotty, 2003) have argued that the justification of the choice of our methodology reaches deeper into the epistemological position we as researchers hold. This study is located within the constructivist epistemological position. There are a number of methodologies which fall under the constructivist standpoint; these lead to different research paradigms and methods of data collection. In the first section of this chapter, epistemological issues relating to this study are discussed. Then, based on the epistemological position of this study, the appropriate research paradigm employed in this study is outlined.

3.2. Epistemological issues

Cohen, Manion and Morrison (2001, p. 6) describe epistemology as 'the very bases of knowledge – its nature and forms, how it can be acquired, and how communicated to other human beings'. Maynard (1994, p. 10, cited in Crotty 2003, p. 8) further adds that epistemology provides 'philosophical grounding for deciding what kinds of knowledge are possible and how we can ensure that they are both adequate and legitimate'. There are a range of epistemologies, but two distinct positions, positivism and constructivism shall be briefly described and compared.

A positivist aligns with the view that knowledge is hard, objective and tangible; this requires the researcher to take an observer role in the research process and to employ the methods of natural science in producing knowledge (Cohen et al., 2001; Lincoln & Guba, 1985). It is common to see a positivist epistemological stance used in traditional educational research. Webb (1996) points out that some educational developers are tempted to adopt a positivist position to justify 'good' research practice. Case (2000) points out that this happens especially when educational researchers in technical areas attempt to establish credibility with their teaching colleagues. Furthermore, the positivist epistemology is especially prevalent in the science and engineering context, partly owing to researchers usually coming from a science background. The positivist epistemology has been critiqued, especially with its applicability to humanities and social research contexts (Crotty, 2003; Lincoln & Guba, 1985). According to Lincoln and Guba (1985, p. 27), 'positivism has produced research with human respondents that ignore their humanness, a fact that has not only ethical but also validity implications'. Non-positivist epistemology, specifically constructivism, has been suggested as the most appropriate in these contexts.

'Although the opponents of positivism within social science itself subscribe to a variety of schools of thought each with its own subtly different epistemological viewpoint, they are united by their common rejection of the belief that human behaviour is governed by general, universal laws and characterized by underlying regularities.' (Cohen et al., 2001, p. 19). As has been indicated at the beginning of this chapter, the most prevalent epistemological position in this study is constructivism. It is non-positivist and as a result, it rejects the view that there is objective truth out there for us to discover. Constructivism is briefly discussed below.

Constructivism refers to the view that 'Truth, or meaning, comes into existence in and out of our engagement with the realities in our world. There is no meaning without a mind. Meaning is not discovered, but constructed.' (Crotty, 2003, pp. 8-9). Crotty (2003) states that it is for the above reasons that different people may construct meaning in different ways, even in relation to

the same phenomenon. In this view, subject and object work together to generate meaning. Putting constructivism into the context of student learning, Case (2000) states that constructivism goes beyond the constructivist view of learning, to viewing the knowledge produced as useful and meaningful constructions rather than the measurable truth.

The importance of epistemology goes beyond the type of knowledge produced, but it also affects *how* this knowledge is produced. For example, a traditional positivist will be required to state a hypothesis, and then employ quantitative methods of data collection followed by rigorous statistical data analysis techniques, with the aim of producing results that can be generalized. On the other hand, a constructivist will be interested in investigating and understanding in detail the issues that may be context-specific. Rather than aiming for generalized knowledge like positivists, constructivists focus their energies on building meaningful constructions that are useful in particular contexts. By focusing on a particular course context, this study fully aligns to the constructivist epistemology. This is illustrated in the carefully selected research paradigm, which is the subject of the next section.

3.3. The naturalistic paradigm

This section addresses the issues regarding the naturalistic paradigm, which provides the framing and the justifications of the methods used in conducting this research.

In their 1985 publication, *Naturalistic Inquiry*, Yvonna Lincoln and Egon Guba laid out a coherent argument for human research to be conducted in natural settings and suggested a logical methodology to be used in such research. This research paradigm has been the most influential as it provides the broad philosophical framing of the current study. Starting with issues of ontology and epistemology, Lincoln and Guba (1985, p. 37) firstly take the constructivist epistemological position, that 'realities are multiple, constructed and holistic'. Secondly they assert that the known and the knower are interactive and inseparable. This implies that one cannot separate oneself from the world when studying the world, because one is part of that world.

In addition to their philosophical position, Lincoln and Guba (1985) further take up a particular position on other philosophical issues which they term 'axioms' of the naturalistic paradigm. They question the possibility of time and context-free generalization of research findings, stating that naturalistic inquiry must aim to produce an 'ideographic' body of knowledge that describes individual cases. Thus, instead of the researcher aiming to generalize results, they argue that the onus is on the reader to determine the transferability and fittingness of the results to a particular context. When it comes to the values of inquiry, Lincoln and Guba state that value-free research is an unattainable goal. They argue that inquiry is 'value-bound' and the researcher must acknowledge this and strive to make these values explicit when reporting on research. These values include personal values, values that inhere in paradigms, theory and context.

In conducting research within the naturalistic paradigm, Lincoln and Guba (1985) state that the researcher needs more than just the above axioms, and they also state a number of important implications of the paradigm in the actual research operations. These will be briefly described as nearly all of them are applicable to the methods used in this research. Firstly, because of the nature of educational research, which typically aims for better understanding of how people think and act, natural settings are favoured, as this allows realities to emerge as whole and not in isolation to their natural contexts. Lincoln and Guba (1985, p. 39) state that 'the research interaction should take place with the entity-in-context for fullest understanding; because of the belief that context is crucial in deciding whether or not a finding may have meaning'. Secondly, in addition to natural settings, the use of human instruments instead of pen-and-paper instruments is favoured because of the ability of humans to grasp meaning, pick up subtleties, adapt to new situations, and generally operate more effectively in any complex situations. Lincoln and Guba (1985) emphasize that it would be virtually impossible to devise a non-human instrument which would sufficiently adapt and adjust to all the varieties of realities.

Owing to the philosophical stance adopted in the naturalistic paradigm, random or representative sampling is rejected in favour of purposive sampling. Here, the researcher is no longer interested in seeking to generalize the findings to the broader populations, but rather seeks to uncover as much variation as possible within a particular area of research focus. Rather than quantitative sampling methods, Lincoln and Guba (1985, p. 40) argue that 'purposive sampling can be pursued in ways that will maximize the investigator's ability to devise grounded theory that takes adequate account of local conditions, local mutual shapings and local values (for possible transferability)'.

In the naturalistic paradigm, inductive data analysis is preferred over deductive data analysis. Whereas deductive data analysis usually entails testing data against a prior hypothesis, Lincoln and Guba (1985) suggest the adoption of an inductive methodology. In addition to this, Lincoln and Guba (1985, p. 40) say that 'such analysis is more likely to make investigator-respondent (or object) interaction explicit, recognizable and accountable; because this process is more likely to describe fully the setting and to make the decisions about transferability to other settings much easier'.

Probably the most prominent question regarding the naturalistic paradigm is that of the trustworthiness of the findings, which Lincoln and Guba (1985) address substantially. In the traditional positivist paradigm, the criteria used for trustworthiness are that of internal validity, external validity, reliability and objectivity. However, if one adopts the constructivist epistemological position these criteria fall away. Lincoln and Guba (1985) argue that a new set of criteria for trustworthiness are needed for the new paradigm. For each of the traditional criteria, they suggest an alternative measure for testing the trustworthiness of the results. Each of these measures is briefly discussed below:

Internal validity is traditionally defined as the 'extent to which variations in an outcome (dependent) variable can be attributed to controlled variation in the independent variable' (Lincoln & Guba, 1985, p. 290). Lincoln and Guba (1985)

suggest that the underlying issue is that of 'truth value', which entails how one can establish 'truth' in the findings of a particular inquiry. The use of internal validity assumes that truth is real and is out there. This however does not align with the constructivist position. In place of internal validity, Lincoln and Guba (1985) suggest a new criterion of 'credibility', the extent to which the researcher has represented not 'truth' but rather multiple constructions that are held by the participants.

Similarly, Lincoln and Guba (1985) suggest 'transferability', which they measure as a direct function of the similarity between two contexts to replace external validity, which is concerned with generalisability of the results. Regarding the issue of reliability, Lincoln and Guba (1985) show how this depends on an assumption of naïve realism and suggests 'dependability', in which the naturalist seeks meaning for taking into account both instability and design-induced change. Likewise they show how objectivity is no longer a useful construct, and suggest the construct of confirmability, which is the assurance that the research findings are rooted in the contexts and persons apart from the researcher.

3.4. Conclusion

This chapter addressed important issues regarding the epistemological position as well as issues relating to the methodology of this study. Starting with the epistemological issues relating to the study, two positions, positivism and constructivism have been briefly addressed, with the latter being the favourable position. I then discussed issues regarding the naturalistic research paradigm, which provides a broad philosophical framing for the study. Following on this philosophical framing, qualitative methods of data analysis are adopted. Having laid out the methodology for this chapter, I shall move forward to address specific research methods that were used in this study.

Chapter 4

Methods of data collection and analysis

4.1. Introduction

Chapter 3 outlined the research methodology used in the present study. This included the constructivist epistemological position and the naturalistic research paradigm. While justifications for selecting particular methods were discussed in Chapter 3, this chapter aims to inform the reader about the details of how the study was conducted and how data were collected and analyzed.

4.2. Data collection

In the early exploratory stages of this project, the short version of the widely used Approaches to Studying Inventory (ASI) was completed by all the students in the course on two occasions during the course. The questionnaire is reproduced in Appendix A and also includes additional questions about students' school and family backgrounds. It was hoped that the ASI scores would provide information on students' approaches to learning, but the results were inconclusive, with most students scoring highly on both deep and surface approaches, which was categorised as 'cannot tell'. Furthermore, an examination of the inventory items raised questions as to the multiple ways in which these might be interpreted by students from varying linguistic backgrounds. It was therefore decided that interviews might provide more useful data to inform the present study. Data collection for this study was therefore through one-to-one in-depth individual interviews with a purposive sample of students. Section 4.2.2 will provide the details of how the sample was selected, but before that, it is important to talk about the pilot interview, which was conducted before the actual interviews. This is discussed below.

4.2.1. Pilot interviews

Based on the primary research questions, there are two reasons why the pilot interviews were conducted. Firstly, they were conducted in order to establish which topics, specifically relating to their previous school, family and financial situations, students were willing to talk about. Secondly, it was important to

establish how to get students to talk substantially about their experiences throughout the year, with initial reference to the two inventories that they had completed. Two students were selected, one for each pilot interview, which lasted for approximately 90 minutes. During this time, each of the topics that are covered in the research questions were discussed, and notes on how to ask particular questions were taken.

The most useful findings from the pilot interviews were firstly that students gave various reasons to justify their short ASI responses. This helped in developing the interview protocol around how to ask for more information. Secondly, it was found that students did give adequate information regarding their past school experiences, family support and financial situations; however, it became clear that one needed to be very careful and sensitive when asking these questions in order not to offend the student. Lastly, it was observed that students were reluctant to talk in great detail about their experiences with homework assignments and gave short responses such as 'they were okay' or 'they didn't make any difference'. This was therefore modified to include specific questions relating to Part B of the homework assignment during the interview.

At the personal level, the pilot interview helped me to feel at ease with my questioning methods and to be relaxed while doing so. The pilot interviews also gave me a chance to practise and to be aware of what it entails to conduct an interview with students. The next section gives details of how the sample was selected.

4.2.2. Selection of interviewees

The selection of interviewees entailed the following considerations:

- Firstly, a sample size of 10 students was selected because this would be a manageable number in terms of setting up and transcribing the data from each of the interviews. Also, owing to the size and time frame of a masters project, a larger sample would require more time.

- Secondly, a purposive sampling strategy as mentioned under the naturalistic paradigm in the previous chapter was adopted. This strategy involves seeking maximum diversity in characteristics considered most important to the research questions. In this study, the two most important characteristics of the students used were their approaches to learning scores and a representation from diverse socio-economic and school backgrounds.
- Lastly, Table 4-1 gives a summary of basic information about these students. At this point, it is important to emphasize that although gender and race are also included on the table, these did not have any role in the analysis of results.

In order to achieve maximum diversity in the sample of students, the short ASI responses of all 80 students had to be assessed for the choice of ten who met the chosen selection criteria. These were a group of students with a diverse range of approach to learning responses and diverse backgrounds. With the permission of the lecturer, these ten chosen students were then approached in class on the third last week of term and the research project was introduced to them. Permission to interview them was requested and they were informed that they were not forced to participate and that if felt that they did not want to participate, they did not have to do so. The ten students were, however, all very keen to be interviewed. Students were asked to book for an interview time slot on a time sheet that had been prepared for them. This time sheet, together with specific statements directed to each of the students during the interview is presented in Appendix B.

The interview took place around a table in a quiet room that had been booked throughout the interview period. On average, the interviews lasted between 35-50 minutes and this depended on how adequately I felt each topic was addressed in the interview. All the interviews were audio-taped and later transcribed. A sample interview transcript is given in Appendix C.

4.2.3. Interview protocol

The term 'conversation' with the students rather than 'interview' was chosen to be used to emphasise that this was to be a relaxed environment in which the researcher and the students would be talking (Kvale, 1996). The students were told that the researcher did not have set questions which would systematically be asked of them, but that the researcher would slowly direct them to address key issues that she had in mind, regardless of how they talked. The order of the questions was not important, as long as by the end of the conversation all the key issues would have been covered. Based on their short ASI responses, each student was asked to explain or elaborate. Then the conversation unfolded from their responses.

Table 4-1: Selection of interviewees according to purposive sampling technique

Interviewee	Inventory 1	Inventory 2	Shift	Former school resourced?	Did school prepare you adequately?	Fees paid by:	Gender	Race
Claire	Deep	cant tell	(-ve)shift	Yes	Yes	Parents	female	African
Sipho	cant tell	deep	(+ve)shift	Yes	Yes	Bursary	male	African
Arabang	Deep	deep	no shift	No	Yes	Financial aid	male	African
Kenny	Deep	cant tell	(-ve)shift	Yes	Yes	Parents	male	white
Kathryn	Deep	cant tell	(-ve)shift	Yes	Yes	Bursary	female	white
Kagiso	cant tell	cant tell	no shift	No	Yes	Financial aid	male	African
Ntsane	cant tell	surface	(-ve)shift	No	No	Financial aid	male	African
Shane	cant tell	surface	(-ve)shift	Somewhat	No	Parents	male	Indian
Cheryl	Deep	deep	no shift	Yes	No	Parents	female	Indian
Emma	Surface	surface	no shift	Somewhat	No	Bursary	female	coloured

Key indicators of school resource level = both library and a functional experimental laboratory available

Briefly, at the beginning of each interview the student would be reminded that he/she had the right to refuse to be interviewed, but it was also indicated to each of them how much their giving some of their precious time was appreciated. They were also reminded that the interview was to be audio-taped. Then, the interview would be started with the discussion about his/her responses on the short ASI, and then the conversation would be allowed to develop. The common topics which were addressed in these discussions were the issues regarding the student's approach to learning, previous school, family background and financial situation. Lastly, students were asked about their experiences with homework assignments. Specifically, they were asked to talk about their experiences of part B of the homework assignments as a 'check' on their approaches to learning. An example of a homework assignment is given in Appendix B.

Now that the methods of data collection have been laid out, the next section presents how data was condensed and then analyzed.

4.3. Data condensation and analyses

This stage followed after interview data had been transcribed. Using guidelines from Miles and Huberman (1994), data were condensed and displayed in the form of tables. The three main tables in which data were condensed were: approach to learning data table, the cultural capital table and the homework assignments table. The approach to learning table summarized each student's responses. The cultural capital table summarized each student's school, financial and family backgrounds and lastly, the homework assignments table summarized students' experiences of homework assignments. The samples of these three tables are presented in Appendix E.

When the data display was complete, the researcher went through the transcripts again to ensure that no important information had been left out. Whenever something that had been missed was found, the tables would be updated. Once this was done, the researcher's comments were noted

alongside each student's responses. This was important for the researcher to note how she was interpreting and understanding the data.

4.4. Analysis of my position in context of the study

When it comes to the values of inquiry, Lincoln and Guba (1985) stated that value-free research is an unattainable goal. They argued that inquiry is value-bound and the inquirer must acknowledge this and strive to make these values explicit when reporting on research. These values are not only the personal values, but also values that inhere in paradigms, theory and context. For this reason, I, the researcher, must examine my values and motives, my past history, and my position in the research context and make them explicit to the reader for the trustworthiness of my interpretations.

As an individual, one of my values in life is to help other people, with a specific focus on student education. My motivation comes strongly from my own experiences in achieving my education so far. I believe that as people, we are capable of far more than we think. At the student level, I believe that students who meet the requirements for studying engineering are very capable of coming out of university with the degrees that they came to study for. However, things do not always work so simply; as a chemical engineer may put it, 'there is a lot of accumulation in the system'. This implies that many of those who come into the system somehow 'sink in' and never rise again. My motivation as a researcher in this study is to investigate why such 'accumulation' happens.

I am not new to the first year chemical engineering course; I was a student in the course in 2002. The course content has advanced a lot with many modifications since then, but the fundamental concepts still remain. Sometimes I look at some of the things students do, and I suddenly relive those moments. As a first year student then, like many others, my main purpose was to pass the course and move on into my second year regardless of how hard I had to work. To my surprise, no matter how hard I worked, I just never got a first class mark for the course and I could never explain why this was so. I was

very keen to understand concepts, I even explained them to my friends, but the results were never to the level that they should have been. I asked myself many times, did it mean that those in my class who always got first classes were cleverer than I was? Or was there something that I just never got right? Or was it because I came from a previously disadvantaged school? Clearly there must have been an explanation for my average performance. These are some of the things I battled with, not only in my first year, but throughout my undergraduate studies. But, the pain and disappointment all started in the first year chemical engineering course, the course that I later came to tutor.

As a tutor in the course, I had come to master the concepts that were dealt with because I did them before. Some did not make much sense in my first year, but they became clearer throughout the undergraduate curriculum. I became very well acquainted with the basic concepts and even to a deeper detail than expected at the first year level. This made me very comfortable with helping students. In my tutorial group, I came to know the students and how they worked together. I was not surprised that the situation had not changed much since my time as a student in the course. Students still preferred to form groups with others of the same race and sometimes even same gender, unless the tutor randomised the groups. I noticed that there were still groups that finished the tutorial more quickly than others. I was patient with the slower groups as they needed more time to understand what was required and this was something that I could relate to. I sometimes felt like I understood how they felt and what they were battling with. Therefore, unlike my tutors who used to be impatient with us, and did not comprehend why we took so long to understand things, I would patiently wait and explain; even if it meant an extra thirty minutes after the end of a tutorial session, I would do it. To me the ultimate fulfilment is that someone understood. It has always been difficult for me to separate my role as a tutor who might be less involved at the level of understanding students with learning difficulties from my previous role as a student in the same position.

I believe that my relationship with some students had become more than just as a tutor. Some students came and talked to me about their problems and experiences, both academic and not academic. I think this was because I could relate to them and they could easily relate to me. Also to them, the road they were travelling was difficult, but I think it was encouraging when someone said 'I have travelled it too; it is not too bad once you've walked it'. Sharing some of my experiences with them and encouraging them might have influenced the level in which students could open up to me during the interview and subsequently, my interpretation of what they told me.

Apart from my previous role as a student in the course and my role as a tutor, I had to take on a new role as researcher. This required me to suspend some of my experiences in order to be a good researcher and to avoid my experiences determining my interpretation of students' situations.

It is clear to me that my role in the course context is a complex interaction between being just a tutor, a previous student in the course and being a researcher. It was a challenge to juggle these roles.

4.5. An introduction to the interviewees

This section introduces the reader to the 10 students who were selected for an interview. Note that pseudonyms are used for each student. Each student is introduced and a brief background about them is given.

Arabang

Arabang had attended an under-resourced ex-DET public high school in a small town in the North West province. The school was near his home and it lacked basic educational facilities such as an experimental laboratory and a library. He mentioned that the teachers used to explain things in his home language to make things easier for the class and for the teacher. As a measure of school performance, he indicated that his school's grade 12 results had ranged from 12 percent pass rate the previous year to 65 percent for the year that he completed high school. Although this school may sound rather 'unfavourable', Arabang maintained that it was a great school.

He received UCT Financial Aid, and his parents had to work hard to fund the small amount required as a family contribution. Although Arabang was from a working-class family, with both parents unemployed, he indicated that his parents are very supportive of his education and that they always pushed him to study while he was in high school. Here at UCT he stayed in a student residence.

During the interview, he described his first semester at university as 'horrible'. He struggled to cope with the sudden increase in the workload, which he described as 'tons and tons' of work. He also struggled with time management and had many sleepless nights. He says things got settled when he was about to write his June tests as that was when he started seeing where he was going. He says he came into the second semester better prepared as he constructed his study timetable in time and followed it. And he tried to finish his tutorials during the tutorial session rather than leaving them for later.

Claire

Claire came from an African country in which English and French are the two official languages. English is her first language, which made it easy for her to study in a South African institution. She had completed her A-level examinations in her home country, which she felt prepared her adequately for university. She considered that she was more advantaged to cope with her first year than an ordinary South African, and she felt strongly that South African students who come straight from high school are not prepared enough to face university. Her parents, who are both university lecturers, paid for her education because they wanted the best for her. She said that even though her parents are paying she understood that this was difficult for them and that she had to do her best to graduate in minimum time.

Claire said she perceived herself as a hard worker and is very systematic about how she approaches her studies. She had a functional timetable, which she followed well. She attended lectures and approached lecturers for clarification if she needed it. She was very inquisitive and wanted to know why she was

doing things, which was why she tried to ensure that what she studied made sense.

Claire said that she realized within weeks that even though she was coping well with chemical engineering, it might not be what she wants to do with her life. However, she is going to learn and pick up as much as she can of the skills that she will later use in life. She seemed to be coping very well with all her courses and she is passing everything comfortably.

Cheryl

Cheryl had attended a relatively better-resourced public school in Durban. However, she described the school as being 'really bad' with teachers who did not care and did not get their work done. She said that most of the learners depended on extra classes that were offered at a local university. She described one of her teachers as being 'useless' as he could not explain things properly and confused himself in front of them. She said if it had not been due to the help of the extra lessons and her mother, who is an Afrikaans teacher, she could not have made it. She said that her parents, who also paid for all her university costs, were very supportive of her education and encouraged her to do the best she could.

For Cheryl, coping at university had been very difficult. She had changed from the way she used to approach her school work. She complained about too high a workload, which prevented her from engaging with what she learned. She felt that she had become 'dumb' as she often got bad marks for tests. She said this had affected her as she then found it difficult to approach someone for help in order to protect herself from others thinking that she was really 'dumb'. Cheryl said that university was not quite what she expected. She had expected to pass everything comfortably. Her timetable did not seem to work and she got tired of having too many things to do. Although she was overwhelmed by everything regarding her studies, she felt like there was still hope for her to pass at the end of the year.

Emma

Emma had attended an averagely-resourced local public school in Cape Town. She described the school as being a 'normal good school' with experimental laboratories and a well-resourced library available. She specifically mentioned that the school was not a 'white school'; hence it did not have all the extra-mural activity facilities such as tennis courts. She said that the teachers at the school were really good and that they paid attention to the students, unlike what she had experienced at university. Emma had 4-year bursary from a large energy company which had indicated to her that she could not repeat any of her academic years. Even though the company paid for everything, she stayed at home and drove daily to the university. She said that her parents somewhat support her in her schooling.

Emma's biggest challenge to university had been her lack of interest in chemical engineering, to which she attributed her low marks. She mentioned that she wanted to study chemistry, but then later decided to do engineering. She seemed to be an indecisive person, who could not stand up for what she believed in. She lacked motivation to study or to try to understand what she was studying.

Kagiso

Kagiso had attended a relatively under-resourced local high school in a small town in the eastern Free State. Kagiso felt that his school, even though not well-resourced, prepared him enough for university. At home, he lived with his uncle because both of his parents had died. He had UCT Financial Aid, but still had to pay a small portion as a family contribution which his uncle struggled to pay. He said that his financial problems worried him a lot because his uncle has his own two children whose schooling he also had to fund.

Kagiso's main challenges were that he had to deal with the stress of an outstanding fee account and the stress of adjusting to a completely new environment away from home. He felt he had a rough first semester and he attributed this to isolating himself from other students and not talking to anyone about things that were bothering him.

During the second semester, he started approaching other students for help when he needed it. This helped somewhat. But his main worry was that he might not get good results at the end of the year because of financial issues.

Kenny

Kenny had attended a well-resourced public high school in Cape Town. He said the school was 'good' and prepared him well academically, however he felt that the school failed to prepare him enough for the shock of coming to university. He lived in an affluent suburb with what he terms 'loving' parents and his younger brother. He said that his family support his education and respect his study time. His parents took full responsibility for paying for his fees, and he said that they would pay for him regardless of which career path he chose.

When talking about his academics, Kenny described himself as 'inherently lazy' and that if he had a choice between working hard or not, he would most likely choose to watch things go by. However, he was strongly motivated to work hard because he was studying exactly what he wanted, which he said he lacked while in high school.

Probably the most striking observation about Kenny was how well and how quickly he was able to adjust to the 'shock' of university. Very early in the year, he realized the importance of learning to 'understand' things rather than memorizing them. He realized that he was required to think, which he did not have to do in high school.

Like most chemical engineering students, Kenny's challenge was still how to manage his time and use it profitably. He usually had long days on campus, which were aggravated by being stuck on traffic both in the morning and in the afternoon when he drove back home. However, he said that even though he did not strictly follow a daily timetable, he was coping well.

Kathryn

Kathryn had attended a well-resourced private girls school in Durban, with an average class size of 20 students. The school had everything from good teachers to good sports fields. Her parents, both medical doctors, paid for her high schooling. She had a bursary from a research company, which covered all her educational expenses, and she still got extra pocket money from her parents every month. Her family was very supportive of her education and motivated her to do her best always.

She excelled in her academic work in general. She was a self-motivated individual who understood her work very well on her own. She felt that she has a great intellectual capacity and she enhances this by putting a lot of effort into her studies. She found the course to be one of her easiest courses, with mathematics being her favourite subject. She believed that she was driven by self-motivation and passion for what she does. For this reason, she believed that other students did not fail because of lack of resources, but rather due to laziness and lack of motivation. She also believed that people who come from previously disadvantaged backgrounds struggled because they had not been taught things properly.

Kathryn's parents immigrated to South Africa from a European country when she was one year old. She said that although she is not an English first language speaker, she had studied in English schools, where she got to perfect her English writing and speaking skills.

Ntsane

Ntsane attended a local high school in Soweto which was very under-resourced. The school did have a library, which he described as 'useless', implying that no one used it because of lack of resources. The school did have an experimental laboratory, but he said they never did the experiments. The teacher would do the experiment alone, then come and write things that he thought were important from his observations. He described himself as being 'independent' from teachers and relied only on teaching himself. He said that the school failed to prepare him enough for university.

The conditions at home were also not conducive for studying, which forced him to use a local library whenever he needed to study. At home, there were only two bedrooms, one for the guardian (he had no parents) and one which he had to share with his brothers and cousins. There was no table in the bedroom that he could use for studying, and the only table he could use was in the kitchen; however the kitchen itself was not quiet as someone might be watching TV, which he found to be very distracting. Ntsane's fees are paid by UCT Financial Aid, but his guardian had to pay the family contribution.

Ntsane's biggest challenges during first year were getting textbooks late and time management. He says that by the time he got textbooks, a lot of work had already been covered and it took him more than twice as much time to try to catch up. He also found it difficult to manage his time, which changed the way he approached his work. For example he said he used to spend a lot of time trying to understand the concepts he was learning, but now he no longer has much time to do so, thus he just rushes through the work without thorough understanding. He said he did attend most of his lectures, but sometimes he just did not understand lecture notes and had to refer to the textbook. This was why he was left behind until he got his books.

Shane

Shane had attended an averagely-resourced local school in Cape Town, which he regarded as 'not a good school'. He said he attended this school because it was close to home. He said that the problem was not so much the teachers or the school itself, but the surroundings of the school were a 'bit off'. The school had a library but no one used it; he used the community library when he needed it. He said his parents were very supportive and that he was lucky to have them. His father took care of his fees.

Shane was repeating the course and said he learned a lot from his mistakes the previous year. He had changed many things about the way he approached his academics; he no longer read more information than what he was required to which he said saved him a lot of time. When he did not understand what he

learned, he approached either the tutors or the lecturers to get clarity, which he did not do in the previous year.

Shane stayed at home. His big challenge during the year had been getting to university on time. He said sometimes he got stuck in traffic and was then late for his first lecture. He experienced the same problem when going back home and so by the time he got home, he was feeling tired and could not study effectively. He said that the travelling to university had caused him to lack good sleep and to struggle with his academic work. However, his father recently bought him a car, which he believed was going to ease his travelling problems.

Sipho

Sipho is an international student from a neighbouring country. He attended what he described as the best school in that country, with all the resources that he needed to succeed. He regarded himself as one of the very fortunate few who got to attend a school of that calibre. He said the teachers he had were the best in the country, and he felt confident that they adequately prepared him. After completing high school, he went to do one year of BSc at a local university. After completing his first year there, he decided to come to Cape Town for chemical engineering. The government of his country paid for all his fees and provided him with a living allowance. Sipho said that his family was very supportive in his studies and motivated him. Also, he had friends back at home, who expected only the best from him and this encouraged him to do well in his studies.

When it came to his academics, Sipho was a dedicated and highly self-motivated student who believed in learning things to understand them. He preferred doing his work alone and would only ask others when he did not understand. He also did not hesitate to ask a question in class for clarity when he felt it was necessary to do so.

When asked what his main challenges this year were, he said that he could not think of any serious challenges that could have affected his academics. He said

that he found this year very manageable and this may be attributed to his familiarity with the content of some of his courses (mathematics, chemistry and physics) which he had done in his first year at university. He felt that although high school did prepare him, it was absolutely necessary for him to have spent the one year at another university before coming here. He said that during that time, he learned to deal with failure, and to make a clear distinction between high school life and university. By the time he came to UCT, he did not have to deal with adjustment issues. He was looking forward to his second year in chemical engineering.

4.6. Conclusion

This chapter has outlined the methods of data collection and analysis used and presented the researcher's position in the study and introduced the interviewees. The next two chapters present the findings of this study. Chapter 5 provides the core of the approach to learning results. The findings on students' cultural capital are then presented in Chapter 6.

Chapter 5

Students' approaches to learning

5.1. Introduction

There are two main focuses of the present study. The first one is to investigate whether the construct of approach to learning can explain students' success in their course. The second one is to investigate whether students' cultural capital can explain their success in the course. The purpose of this chapter is to present the interview findings on students' approaches to learning.

The first section of this chapter presents the summary of students' approaches to learning as they emerged from interviews. The second section starts by defining categories used in classifying students into different approaches to learning categories. In the third section, each of the students is classified into a category, then evidence from the interview is provided to support the classification. In the last section students' approaches to learning are compared with their final course mark to evaluate the success of a particular approach to learning.

5.2. Summary of the interview results

Table 5-1: Summary of the interview results

	Approaches to learning	
	<i>Earlier</i>	<i>Later</i>
Claire	Deep	Deep
Sipho	Deep	Deep
Arabang	Deep	Strategic
Kenny	Deep	Strategic
Kathryn	Deep	Strategic
Kagiso	Deep	Strategic
Ntsane	Deep	Strategic
Shane	Deep	Strategic
Cheryl	Deep	Surface
Emma	Surface	Surface

5.3. Introduction to categories emerging from interviews

The purpose of this section is to introduce the categories used to classify students according to their different approaches to learning. Each category represents a combination of the approaches to learning that each student used at the beginning of the year and at the end of the year. The five categories are:

- deep → deep approach,
- deep → strategic approach,
- deep → surface approach, and
- surface → surface approach.

All of these categories emerged from interview data. Note that an arrow in the middle represents a 'shift' from one approach to the other. A brief description of each category is given below.

Deep→ deep approach

The deep approach to learning involves the student's intention to grasp the meaning of what they are learning, which is achieved through focusing on understanding concepts and more often by relating these concepts to real life contexts. In essence, the category deep → deep approach does not represent a shift; it means that students who fall in this category have consistently used a deep approach both at the beginning and at the end of the year.

Deep → strategic approach

A deep approach is defined as in the above category. A strategic approach is herein defined not as a new approach as such, but as the use of both deep and surface approaches depending on the approach that will yield the highest grades. Students who use a strategic approach primarily use the deep approach, but sometimes use the surface approach when they are influenced by factors such as time and method of assessment. For example, a student who normally learns the material to understand may find himself/herself memorizing a few things the night before the test, if he/she believes that it will help him/her remember the material for the test the next morning.

As observed in Table 5-1 earlier, six of the ten students interviewed are classified into this category. This implies students generally 'shifted' from using only a deep approach to also using a combination of deep and surface approach depending on what they perceived to be the most suitable approach at that time.

Deep → surface approach

This category represents the biggest shift, in which a student changes from primarily learning material to understand it, engaging with the material at a deeper level, and relating things to practical life examples, towards predominantly memorizing material without any interest in or understanding of what they are learning.

Surface → surface approach

This category also essentially represents no shift as students who fall in this category have consistently used the surface approach throughout the year. The surface approach entails the student's intention to memorize the material they learn without focusing on understanding the underlying concepts. The students then hope to reproduce the memorized information during assessment.

Now that the categories have been defined, the next section will use these categories to classify students. Evidence from the interviews will be provided to justify the classification of each student.

5.4. Classification of students into the categories

Deep → deep approach category

The first characteristic of students who fall within this category is that they express the intention to understand ideas and concepts for themselves and they do this by consistently looking for the meaning of what they learn. Two students, Claire and Siphon, have consistently shown this characteristic.

First I try to understand what the lecturer is saying, afterwards I have to simplify it to the terms that I personally will understand maybe relate it to something that I know from somewhere. In a way I won't have to remember exactly what the lecturer is saying, but in such a way that I can use my own analogies to understand easier...well every new thing that I learn, I relate it to something that I already know, and in that way it becomes sort of continuous.

(Sipho's interview)

Sipho's statement also refers to the second important characteristic of a deep approach, and these are shown when Sipho tries to relate what he learns to something that he has learned before and this helps in developing continuity with the material that is learned.

Rather than aiming to memorize and remember what they have been taught, the third characteristic of students who fall within this category is to look for underlying principles and check evidence to reach their own conclusions about what they are learning.

The best way is to go and look for a different source, evaluation of the evidence to try and understand. It is very important to understand what the person is saying, and understand the evidence then I can come up with my own conclusion based on what they said.

(Sipho's interview)

The students in this category want to know how what they have learned fits in to the real life context. Claire demonstrated this characteristic by taking a concept that she had learned in class and relating it to a very important current issue:

Um, cause the one thing that I'm very interested in right now is energy calculation, like doing something in renewable energy. If I continue in chemical engineering, that is a really big thing right now, and now we've been doing calculations on how to save energy and how to maximize production and how to use the energy from that side without extra waste of it.

(Claire's interview)

Students in this category critically examine evidence provided to them and listen to arguments and reasons behind things. They look for further evidence when they need to, and then reach their conclusion regarding what they are learning.

I agree, I like proof, I like things that make sense, I don't want someone saying $1 + 1$ equal to 2 without being able to prove it how that came about. So in a way, I don't just want things or someone to just saying something without saying why, then if I ask you why you begin to tremble, making statements that are not credible to me.

(Claire's transcript)

What makes the students in this category different from other categories is that their use of deep approach to learning remained consistent throughout the year. They seem to be on top of their work, and they manage their time very well. These acknowledge that the time they have for learning is limited; they however manage it such that they can still engage with the material they learn at the deeper level. Claire and Sipho's previous educational experience may have played an important role to better prepare them for the approach to learning that might be expected of them when they are at university. This could be one of the reasons why they remained using this approach when other students were unsure of what was expected.

Deep → strategic approach category

Students in this category generally exhibit similar characteristics to those in the deep-deep approach category, but differ in that they have shifted towards a situation where they sometimes do adopt the surface approach. This means that they do put effort into understanding concepts, relating what they learn to previous knowledge and to real life contexts; however, the approach that each student uses is not consistent as shown in the previous category and it changes with the intention of achieving the highest possible grade in any assessment task. In other words, depending on what the assessment requirement demands of the student, a deep approach may be used, but if a surface approach seems to lead to the highest mark, then the student opts to use the surface approach.

Six of the ten students who were interviewed - Arabang, Kagiso, Kathryn, Kenny, Ntsane, and Shane - fall within this category. They have shown a general shift from primarily using only a deep approach earlier in the year, to adopting the strategic approach. They showed characteristics of the deep approach, for example, both Arabang and Kathryn mentioned how relating things to the practical real life context makes understanding things much easier for them. Ntsane mentioned that he likes to take what he is learning and change it to his way of thinking, giving himself relevant examples that allow him to understand the material better. For Kagiso and Kenny, some of ideas that come during their academic reading send them to think about how things came about. For example, Kenny mentioned how one day he found himself wondering and thinking of how someone out there thought about designing a diesel engine. These students do show characteristics of using deep approach to learning; they do however mention that sometimes it depends on the level of interest in what is learned, the time available to learn it and what is asked of them in a test. To illustrate some of the 'shifts' that students experienced, when Ntsane was asked whether he relates what he learns to real life contexts, he said:

Well most of the time when I solve problems I no longer solve them the way I used to. I no longer look at the question and start to think about it the same way as before. Most of the time I look at the question and see if it is similar to something I have done before then start to do it, and get the answer, then I am done.

(Ntsane's interview)

When he was asked how he used to do things, he stated that:

I used to get more understanding of the question, like visualize it, but now you don't have much time in exams to visualize everything and start writing it down so you just have to write the answer the way you've seen it before and relate it to something you've seen before.

(Ntsane's interview)

Ntsane shows a classic 'before' and 'after' picture. He illustrates the changes that he went through from using one approach to the other. Other students mentioned how other factors such as time, specific contexts and interest in the material affect their approaches.

I think sometimes you can't relate things you learn to real life examples, like mathematics, learning complex numbers, but yes there are things that you can learn and relate them to real life examples, like energy balances in 'chemeng' and relating to a cup of coffee.

(Kathryn's interview)

Kathryn here points out the importance of context in using a particular approach and she implies that there are circumstances in which one can adopt a deep approach, but not with other contexts. Kenny mentioned that for him, some things are not necessary to look at beyond face value:

Some things, if it is a concept like for example, sequences and series in mathematics, I honestly couldn't care how the theorem was or came about and things like complex numbers, come on...Ja you can't question everything, you can't question mathematics. I can't start saying Einstein is wrong. I mean where do I start to disprove his theory? I can't prove that.

(Kenny's interview)

Kenny points out that one cannot understand the origin of everything and it will be too difficult to find out how some of these things came about. For Kagiso, interest in what he learns plays an important role in how he goes about understanding the material. If something interests him, he stops and thinks more about it, but if he finds it less interesting, then he spends less time thinking about it.

Shane's experience is a bit different from the other students in this category. As a repeating student, he referred a lot to his past experience in the course. He used to predominantly use a deep approach, however, he did not succeed in the course. Then he decided to adopt a strategic approach. He showed evidence of using a deep approach when he said:

I think when the lecturer teaches, I try to apply it to the real life problem. So I am not learning something just to pass through varsity, but to see how I will apply it as a chemical engineer, like mass balances, unit conversion and others. I think also when you learn something and you apply it, I think you will remember it better.

(Shane's transcript)

Then he reflects back on how he used to do things in the past and talks about his new strategy in the course:

Ja I learned a lot from then. I think first year I...I tried to be independent, too much to myself and just wanted to learn a lot and just wanted to learn everything that passes my way...I think this year, I told myself that I'm not gonna waste time to go and investigate this, if I do I might go on another road. So I decided that I will just stick to what the lecturer has given me, probably look at the text books when I research on my own.

(Shane's transcript)

Shane's statement does show that his experience from last year has taught him to become very strategic with his time and how he uses it.

All of the students who fall within this category mentioned that time has become a big issue in how much they engage in the material. Some blame the workload, which they feel does not allow enough time to engage with the course material. There are two common themes that emerge among this group of students. Firstly, they use a deep approach, but find that it is unnecessary to use it in some contexts. Secondly, they somehow feel that the time and the workload has become an issue that does not allow them to engage with their learning material. When these students are compared with the deep to deep approach group, one can pick up that both groups do to some extent use a deep approach, however the commitment to continuously use this approach is not as consistent in the deep to strategic approach category as it is in the deep to deep approach category. Another important difference is how both groups react towards time pressure. The deep to deep approach group does acknowledge that time is limited, but rather than changing from a deep

approach to a surface approach, they continue to somehow find time to engage with the material at the deep level.

Deep → surface approach

Cheryl is the only one out of the ten students who showed the extreme shift from using primarily a deep approach to using a surface approach. When she was asked about statement 8 whether 'ideas that she comes across in her academic reading often set her off on long chains of thought', she said:

I used to enjoy thinking of stuff, like science and you know, try to really get involved in it. But now is like I just don't seem to be enthusiastic to think about things anymore.

(Cheryl's interview)

When asked what she does, she mentioned that she now learns just so that information goes in. When asked whether she looks at the evidence carefully to reach her own conclusion about what she learns she mentioned that she does:

I like to give my own way, you know, I like to take what I am learning and change into my own way of thinking which I understand better...for example, if they teach you something and give you an example, I like to formulate my own example just to see that it works.

(Cheryl's interview)

Contradicting the above statement, when she was asked whether she tends to take what she learns at face-value without questioning it much, she said:

I used to be very objective and think of stuff, but now I just believe everything. I no longer question something or go to debate it with someone to maybe check if my point is correct. It is now a time issue.

(Cheryl's interview)

Cheryl further demonstrated her shift from using a deep approach to a surface approach by admitting that she has been going through the motions of studying without knowing where she is going. She said:

I told you, I used to want to have an understanding of things. But now, I like just get the work done, as long as at least you go through everything once. At least try not to have anything outstanding....Ja it is the workload and the amount of time. Ja you've got this and that to do. So in order to do everything you cannot do one thing thoroughly.

(Cheryl's interview)

Cheryl certainly experienced the greatest shift when compared to the other students. While the other students still use deep approaches, she seemed to be predominantly using a surface approach; she started to demonstrate similar characteristics as Emma who is described in the category below.

Surface → surface approach category

There is only one student who falls within this category, Emma. The student in this category used a surface approach consistently throughout the year. She does not seem to have the intention to understand the material learned at the deeper level. Her intention is to learn the material, memorize it and be in a position to reproduce it whenever it is required:

Well sometimes is like, if you go through the stuff, you just like memorize the equation or the method of how you do things. You don't have to know why you do these things. But you do it anyway because maybe you will get the right answer...I don't actually go through it, like if I don't understand it in class, I won't sit up at night and try to figure out what they meant. I will leave it till the last minute, like before the test then I will go back and ask myself, what they mean here.

(Emma's interview)

During the interview, Emma was asked whether she goes through her work to try and understand it. She mentioned that she does try to understand, but she says that sometimes things that she learns 'just don't go in'. It seemed that she kept things that she learned as 'unrelated bits and pieces in her mind'. When asked whether she often used real life examples in trying to understand the material, she said that it is sometimes very difficult to imagine the stuff she learns.

Another aspect of surface approach that emerged during Emma's interview was her lack of interest in what she is studying.

Well I can't really imagine these things, I mean even though chemeng is what I want to study, but I can't like picture myself doing that stuff.. I usually ask myself, what or how do they do this stuff? 'Cause I wanted to do it. Well I like chemistry, so I thought maybe I can do a BSc, but then I thought what do I do with a BSc? So I thought okay, I will do chemeng.

(Emma's interview)

One thing that emerged from the interview about Emma was her lack of confidence in drawing her own conclusions. She could easily be swayed into believing that she is wrong even though she may be right. When asked whether she looks at evidence in her readings to reach her own conclusions, she said:

Well, not really because if I were to reach my own conclusion, maybe my conclusion is not right. So I'd rather say well the textbook can't be wrong. So I'd rather believe what they say instead of making up something for myself.

(Emma's interview)

She clearly showed her intention to cope with the course requirements by studying without purpose and strategy when she said:

Well you have to [laughs], in order to pass, you have to go through the motions of doing this stuff, I mean some of these things you are not even so sure of.

(Emma's interview)

One can conclude that Emma adopted a surface approach to learning throughout the course.

Students' response towards homework assignments

During each of the interviews, students were asked general questions about their experiences of homework assignments. Their responses are hereby used to support students' classification into the various categories above.

Deep → deep approach category

When Sipho was asked about his experience with homework assignments he said that at the beginning of the year they annoyed him because he did not see the point for doing them. However, during the course of the year, he found them very helpful as they became more challenging. Claire also found them helpful because once she had done the homework assignment, she was sure that she understood that concept. Both Claire and Sipho saw the link between Part A and Part B of the homework assignment. Claire mentioned that it allowed her to reinforce what she had done in Part A and moreover, to be able to test various conditions of the situation in Part A. Sipho talked about how they help you deal with concepts that are 'thrown' at you.

I also think if you just have concepts being thrown at you, without much care if you understand them, well homework assignments care enough to check and reinforce those concepts. They steer you in the right direction.

(Sipho's interview)

The most important aspect of the homework assignment that emerged from Claire and Sipho's interviews was the need to understand concepts and to realize the practical real life situations in which their calculations are applicable and to test various conditions. This supports the finding regarding their consistent use of a deep approach.

Deep → strategic approach

Students in this group also found the homework assignments useful in that these allowed them to understand concepts. Kathryn talked about how she looked back at the homework assignments while studying for a test so that she could see the concepts that were presented there. Kenny said that for him homework assignments were a checkpoint; if he could do a homework assignment he was okay, if he could not do it he worried and put more effort in understanding them.

Arabang and Kagiso gave two very similar responses towards Part B of the homework assignments:

Part B was always the killer. I mean it always forced you to think deep. But I think it was good that way.

(Arabang's interview)

Part B, especially, that's where the problems, that where I was stretched to think and understand...it helps you to think about the calculations you did in Part A. also it gave real life problems...er how to tackle real a problem. Yep.

(Kagiso's interview)

While the homework assignment, specifically Part B, was perceived positively by other students, Ntsane had a different experience:

I don't think they made any difference. Because, sometimes like you never even had time to do it, so you do it on Tuesday then you just submit it. So when you write it you just write it to get rid of it because you know that it is a DP requirement ja. So ja. So just like that.

(Ntsane's interview)

The interesting thing that came out of their responses is how they mentioned that Part B 'forced' them to think. This might mean that Part B allowed them to think more about the concepts that they could not have engaged with if they were not 'forced' to do so. This would be one of the characteristics of a strategic approach; they are okay with the material, but would engage more if they were required to or if they were forced to. Their main focus seems to be on passion for the course.

Surface → surface approach category

Emma mentioned that the homework assignments were okay except Part B. This clearly indicates that she is not interested in understanding the concept, but just interested in going through the motions of doing calculations. She did not see the link and wondered why she was asked the things in Part B.

Well they were okay, except Part B...I don't know, cause some of the things I was asking myself why do they ask me this.

(Emma's interview)

She further said,

Well I know that they are intended for me to do them at home and say what I think, but most of the time I said well I don't know what to think. Do you think I care?

(Emma's interview)

Emma is quite straightforward about how she felt about Part B. Her statements demonstrate that she was uninterested in what she had to learn and this did not bother her. She couldn't engage with the material. These are all characteristics of someone who demonstrates the use of a surface approach to learning.

Students' approaches to learning from the interview have been identified and characterized. Homework assignments have also been used as an indication of how students in each category experience them. However, the ultimate concern regarding each student's approach is whether the approach to learning they use led to success in the course. Table 5-2 below presents a summary of students' approaches to learning results from interviews and also gives the success of each student in the course.

Table 5-2: Students' approaches to learning and their course marks

	Approaches to learning		Passed	Pass Mark
	<i>Earlier</i>	<i>Later</i>	CHE1004W	%
Claire	Deep	Deep	Yes	80
Sipho	Deep	Deep	Yes	67
Arabang	Deep	Strategic	No	42
Kenny	Deep	Strategic	Yes	68
Kathryn	Deep	Strategic	Yes	77
Kagiso	Deep	Strategic	No	45
Ntsane	Deep	Strategic	Yes	56
Shane	Deep	Strategic	Yes	66
Cheryl	Deep	Surface	No	41
Emma	Surface	Surface	No	45

There are two things that are immediately observed from the results presented in Table 5-2. The first observation is that the two students who used a deep approach were successful in the course. Secondly, the two students who used

a surface approach at the end of the year were not successful in the course. This suggests to us that the course does encourage and reward the use of a deep approach. However, when looking at the success of students who adopt a strategic approach, it becomes evident that this approach does not work for everyone. In other words, this suggests that there must be something else operating, something else that can explain why some students passed and why some failed. This points us to the next section in which students' cultural capital is investigated.

Chapter 6

Cultural capital

6.1. Introduction

The previous chapter addressed the first two research questions regarding students' approaches to learning. Students were placed into one of the four approaches to learning categories; this placement was supported by data drawn from their interviews. This chapter aims to address the third and fourth research questions which ask about the effects of cultural capital on students' success in the first year engineering course. The first section outlines the indicators of cultural capital that are central to this study; then based on the outlined indicators of cultural capital students were categorized into two cultural capital categories. These were named aligned cultural capital (ACC) and non-aligned cultural capital (NCC). Aligned cultural capital refers to a form of cultural capital that is valued by an educational institution and that fits in with the institutional evaluative standards. Non-aligned cultural capital refers to any other form of cultural capital which may be viewed as different and deficient because it is not valued by an institution. In the second section of this chapter students are placed according to the category that most accurately describes their cultural capital; then to support each placement, evidence from the interviews is provided. The chapter concludes with a comparison between students' cultural capital and their final year mark of the course.

6.2. The key indicators and categories of cultural capital

As reviewed in Chapter 2, the literature has suggested that there are many ways in which cultural capital has been conceptualised and operationalised in empirical studies (Lamont & Lareau, 1988; Lareau & Weininger, 2003; McDonough, 1996). In this study, the following five key indicators of cultural capital were selected for use:

- student's language competency,
- parental empathy (McDonough, 1996; Reay, 2004),
- motivation to reading/types of reading (De Graaf et al., 2000),

- availability of private learning space in the home, and
- availability of a computer (Sullivan, 2001).

Each of these indicators is described below.

Firstly, language competency entails the student's first language, the language spoken at home and the language of instruction at school. I argue that students who are first language English speakers, who have attended schools in which English first language is the main language of instruction and who use English for communicating in the family can be seen as possessing this form of cultural capital and are better able to cope with the language demands of an English medium higher education institution when compared with their counterparts.

Secondly, parental empathy entails parents' personal knowledge regarding higher education. This places parents in a better position to provide empathy and to be more understanding of their children's experiences of higher education institutions. The empathy that these parents are able to offer can be seen as a very useful resource – hence a form of cultural capital – because a student who has access to it receives extra knowledge about an environment that can be very challenging to someone who is having a first time experience in it.

The third indicator, reading, is a very important and useful aspect of culture, because it allows someone to develop strong vocabulary and language competency as well as to engage with the world differently. Reading can be encouraged at home and at school. To be more specific, the reading referred to here is non-academic reading or 'extra reading'. Reading as it is, is very much linked to the previous two indicators. If parents are not themselves readers, and thus do not encourage their children to read, then the children can become non-readers and thus be poorly equipped in terms of language development. In addition to reading, the types of reading are also very important in terms of what one learns out of them. For example, a child who reads tabloid newspapers will not have the same development as the child who is encouraged to read novels. It is very important to note that parents and

teachers play a vital role in encouraging reading; reading is a culture and children learn about it from the people around them. If parents do not buy children books and encourage them to read, then they are disadvantaging them, thus failing to provide this form of cultural capital.

The fourth indicator, the learning space, can be looked at in the form of a student having a separate bedroom in a home. In other words, whenever a student wants to study privately, they are able to do so without inconveniencing or being inconvenienced by the rest of the family. Some students have to share rooms with their siblings, which may not be suitable for studying at any point. The availability of this space is important and thus can be viewed as an added resource in a student's learning.

The last indicator, the availability of a computer in a home can also be seen as an advantage to the student who has one at home compared to the student who does not have one at home. When a computer is available at home, a child can learn to play around with the basic tools such as using Microsoft Office, playing games, learning how to use the keyboard or use it for more sophisticated programs such as finding information from an encyclopaedia and using the internet. The student who does not have this resource at home has to learn and overcome the emotions that come with using a computer, with which the other students are already familiar. Higher education institutions normally do offer beginner courses to introduce students to the important programs in their line of studies, but it is not the same as learning it beforehand, hence one cannot expect the level of competency to be the same for both students. Another important place in which students can be introduced to computers, if not at home, is at their schools. Similar to students who have access to a computer at home, students who were introduced and taught computers at high school may be seen to enjoy the benefits that others did not have – hence better cultural capital.

Having outlined the key indicators of cultural capital above, it is now important to provide a background in which these indicators can be facilitated and encouraged. It is already evident that the home plays a vital role in promoting

and providing cultural capital. However, the importance of the school has not been clearly contextualized. The school provides rich forms of capital by the types of resources that are provided there, an approach to learning encouraged as well as the commitment of the teachers. Resources that the schools can provide include a functional and well-resourced library (including the encouragement to use it), computer centre and well-resourced experimental laboratories. In terms of teachers' commitment to students, one may look at the general interest of teachers in students' learning and their role as motivators and mentors. It is important at this point to mention that teacher's commitment to students is not a duty of one or two teachers, but rather a commitment of the teachers of the school in general. In the South African context, the type of school that a person attends is an indicator of their socio-economic status; the types of resources available and the commitment of teachers at schools are thus very much determined by what one's parents can afford. Therefore a school provides cultural capital directly through an equipped library, laboratories and computers. A school also shows cultural capital indirectly because attendance at a particular school is an indicator of the home type, social class and financial situation. Having said all these, the next section provides interview data of the collective role played by home, school and financial background in providing students with cultural capital.

Table 6-1 summarizes students according to their cultural capital categories based on the interviews. I was somewhat surprised that data fell into two very distinct categories; aligned and non-aligned cultural capital. There was no grey area in the data and this might be because in South Africa, one still finds extreme differences between people of different social classes. The different indicators of cultural capital are shown below.

Table 6-1: Students' categorization according to different cultural capital groups

	Aligned cultural capital	Non-aligned cultural capital
Key indicators		
1. Language used	English	Home language
2. Parental empathy	Yes	No
3. Reading/language development encouraged	Yes	No
4. Student has a private learning space	Yes	No
5. Computer available at home	Yes	No
Additional information		
School type	FO, CA, IN and CO	Ex-DET
Language of instruction	English 1st	Home language/ English 2nd
Functional resourceful library	Yes/No	No
Experimental lab	Yes	No
Teachers committed	partly/very committed	only 1 or 2 teachers committed
Financial resources		
Who pays the fees?	Parents/ Bursary	University's Financial Aid
Who buys books and learning resources?	Parents/ Bursary	Financial Aid/Parents
Students in each category		
	Claire	Arabang
	Cheryl	Kagiso
	Emma	Nisane
	Kathryn	
	Kenny	
	Shane	
	Sipho	

Ex-DET, CO, IN = previously black South African, coloured and Indians only schools respectively

FO = foreign school, CA = former whites only school (now multiracial) in the former Cape province

HEI = Higher Education Institution

6.3. Non-aligned and aligned cultural capital categories

It was mentioned in the previous section that data fell into two distinct categories. The characteristics of each category are presented in Table 6-1. This section provides interview data for each of the students within a category.

6.3.1. Non-aligned cultural capital category

When one looks at cultural capital as a form of investment or a resource that can be used in education, this category is considered to have the least of the 'desired' form of this resource. Students who fall within this category are Arabang, Kagiso and Ntsane; they are all funded by the university Financial Aid. Students who are offered financial assistance by the university are predominantly from the working class groups of South Africa and preference is given to students whose parents are unemployed, one or both parents are deceased, or when the working-class parents have many children in their care with very little income. As mentioned earlier, in South Africa, there are still vast differences between social classes and this affects the resources that a family that belongs to a particular social class, can provide their children. In this subsection, I look at how the home and the previous high school provide cultural capital to the students in this category and use interview data as evidence.

Home / family background

Homes provide cultural capital in terms of the both the tangible and the intangible resources. Tangible resources refer to resources such as computers, reading books, educational television channels and the physical space provided for learning to take place. Other resources which are not tangible but vital include, parental empathy through encouragement and interest in their child's learning. As suggested by McDonough (1996), parents who have attended higher education institutions are more likely to be empathetic towards their children's education through showing interest and through providing the necessary resources in place to aid their children's learning.

The three students in this category come from different families with different challenges. Arabang came from a family of five children and two parents. Both his parents were unemployed. With the large family to be supported and very few resources, it implies that he had to share limited space with his siblings. He is the youngest in the family and the only one who is in a higher education institution. Although his family supports him and encourages him, they are not in a position to provide empathy towards him. For example, he cannot talk in detail with his family members about some of the things he learned at school because already those would be higher level issues for them. His parents were both unemployed; therefore resources such as computers in the house are not available at home. Also, because the parents had not attended university, it would be very difficult for them to provide him with extra reading materials to improve his language literacy; they are not in a position to see if his English literacy is up to the standard demanded by higher education institutions. Not only is reading important, but the types of reading are also very important. When Arabang was asked about what he liked to read, he said:

Actually like reading gossip stuff, I don't like sports much, and I am not sure why people fuss so much about it. So I like to read like magazines like Drum and newspapers like Daily Sun. You know the, *kasi*⁵stuff...

(Arabang's interview)

The kind of magazines and newspapers that Arabang enjoyed reading may be of some development to him, but may not be preparing him for the discourse of higher education. These readings have pages full of pictures, and very little rich informative text to go with the pictures. At the same time, no one can blame him because those are the kind of resources that he is exposed to. Those are the resources that are provided in the family and in the community. That is the kind of capital 'well' from which he draws his cultural capital.

Kagiso comes from a situation considered to be slightly worse than that of Arabang. He does not have parents because both are deceased. He was the only child and is now in the care of his uncle. When I asked him whether he missed home, he said that he did not miss home and he did not know why he

⁵ Kasi is a colloquial term derived from the English word 'location' which refers to a township.

did not. He said that his uncle has two of his own children who are not living with him, but with their mother. His uncle is divorced from the mother of his children and has to provide for both Kagiso and his children. Kagiso often found it difficult to talk to his uncle about his problems especially because he felt that he had already burdened him. The main challenge for him was having resources that money could buy. When asked what he read, he mentioned that he read newspapers, but he did not like to read much except his school work.

No, we didn't read other stuff, well me I don't like reading other things, so I just like to read my school stuff.

(Kagiso's interview)

Children generally adopt what they see being done by their parents or guardians. It is not unusual that both Arabang and Kagiso do not read because the 'culture' of reading is not what they are exposed to or what they are encouraged to do within their families. Also, it becomes difficult for parents to be involved with what their children are learning if they themselves do not have that educational background.

Ntsane does not have parents; he lives with his self-appointed guardian, his aunt. Similar to Arabang and Kagiso, he comes from a family in which reading is not encouraged. When asked whether he does some reading, he said that he did some reading in high school and this was only because he had to. The situation was somewhat worse for him in that he could not study in the house because there was no space for him to do so.

The thing is at home we had like two bedrooms, me, my cousins and my brothers share one and there is no table in the rooms. So the only place I could study would be in the kitchen so instead of studying in the kitchen, you know that you will be tempted to watch TV as others are watching or listening to radio, so you're not going to focus that much so I went to study in the library.

(Ntsane's interview)

One can already tell from his statement that the environment at home, with him, his siblings and his cousins having to share very limited space challenged

him. Similar to others, he also did not read much except his school work. His family could not afford much except to provide him and the others with the very basics such as food and clothing.

From the circumstances that these three students come from, it becomes evident that firstly they were not encouraged to do extra reading, which means that their language literacy may not be at the level demanded by a university. Secondly, the space available for studying is limited in the home, in other words each of them does not have a separate room and they have to share. Also, parents are not able to provide both the empathy and the resources such as computers in the family. All these imply that the cultural capital that these students brought with them may be insufficient to allow them to proceed without serious difficulties.

Previous schools

Arabang, Kagiso and Ntsane attended schools which were formerly designated for black⁶ Africans only. It is not surprising that all the black South African students in this sample come from such schools and this serves as an indication that the effects of the former apartheid era still prevail. These students went to three different schools in three different provinces; however all three schools lacked basic educational resources such as an experimental laboratory, a functional library and teachers who are committed to their work and who motivate their students.

When Ntsane was asked about performing experiments at his school, he mentioned that they never performed experiments. He said the teacher used to do the experiments himself (if he ever did) and wrote all the information that they needed to know on the board; all they needed to do was to copy the information down. He mentioned that they did have a physical place to do experiments, but they just never did them. Similar to Ntsane's situation, Arabang mentioned that he never did experiments at his school

⁶ The use of race is not to indicate a biological state, but as a sociological construct.

Well we never knew that, we never did experiments. We just learned from the equations in the book. We never did any experiments.

(Arabang's interview)

When the students were asked about the use of the school library, all of them mentioned that they did not use the library at school, mainly because the library was poorly-resourced and did not meet their needs. Kagiso mentioned that they did have a library but he never used it. He never got what he was looking for in it. When Ntsane was asked about using the library he said:

I never used that library, for what? The only library I used to use was the neighbourhood library, because most of the time I used to go there and study. I felt good when I studied in a library.

(Ntsane's interview)

It is evident from Ntsane's statement that he would use the school's library if it provided him with the study material that he might have found useful. For example, maybe he could get books for extra reading from the library since these are not provided at home. Similar to Kagiso and Ntsane, Arabang also did not have a resourced library that he could use at his school. One may argue that using a library at a high school level is not vital towards success and this may be true; the library is however, one of the only places where one certainly comes into contact with books, especially for those to whom books are not a 'culture' in the home. Reading library books might open up their horizons and provide possibilities. Without access to books, one might never come to discover one's passion for reading.

When asked about the language of teaching at school, the three mentioned that it was a combination of English and their home languages. The use of the home language may be very important to aid understanding of concepts, however, it becomes a disadvantage when one goes to university where the home language is not a language of instruction. This implies that students who used home languages at school might find it difficult to shift towards using English only. When Arabang was asked whether teachers in different subjects used his home language, he said:

Ja, in most subjects, I mean they could make it easier and just explain it to us in Setswana. You know, just imagine them explaining Biology ka Setswana...[laughs].I mean coming from the locations and having attended those schools, I mean you could get explained the language that you can understand better.

(Arabang's interview)

Kagiso also mentioned that the teachers used Sesotho a lot to explain things to them. He mentioned that the use of Sesotho also made it easier for the teachers as sometimes they struggled a bit with English. For Ntsane, everything was taught in English, except in Zulu lessons. He mentioned that they did participate in English during the class period, but he said it was obviously a different situation once they left class.

One striking observation regarding the situations in their previous schools was how positive Arabang and Kagiso were about their schools. They both felt that they came from good schools. They both had one or two teachers whom they felt contributed a lot towards their positive attitudes. Both of them mentioned that their teachers encouraged them to draw pictures when they solved science problems and to understand questions they were asked before solving them. Ntsane had a different experience when compared to Arabang and Kagiso. He mentioned that teachers at his school did not care much about the pupils' education. He said that he had to work very hard by himself; he did not depend on the teachers. He succeeded through his hard work and dedication to his studies.

The school plays a very important role in providing the capital that students need when they come to a higher education institution. For example, if a school had resources such as experimental laboratories, libraries, and computers, students would feel less intimidated by these when they get to university. The language of instruction at schools can also make it difficult for students to access the 'aligned' form of capital required at university, if their language of instruction is not 'valued' by the institution.

Financial support

One may argue that financial support shows economic capital rather than cultural capital, however, these two are intimately linked. To some extent, economic capital can better explain the type of cultural capital that a family can provide. Financial support has an immense impact in making resources available for someone's education both in terms of paying the fees and in providing resources such as books, computer and general running material such as printing and photocopying. All the three students, Arabang, Kagiso and Ntsane received the university Financial Aid. However, each family had a small portion of contribution that they had to pay. Arabang's family contribution was about two thousand rand. Kagiso's family contribution was seven thousand rand, which his uncle had been unable to pay at the time. He mentioned that his outstanding fee balances worried him a lot and sometimes he could not concentrate on his academics.

Yes, especially first semester, that cost a lot of stress as I had to go appeal with the funding office because I could not afford all the R25 000 amount that was required.

(Kagiso's interview)

Ntsane mentioned that he started the year without textbooks. He said that he had asked for money for books from home and there were so many delays that he ended up getting the books late. He said this greatly affected him and he found it very difficult to catch up.

I didn't have the books on time, and everything just started to go down because I didn't have the book and so on. So I had to struggle to get a book that's why I was left behind. So ja, then after that when I get the books I had to cover lots of chapters and you know covering up is not really easy.

(Ntsane's interview)

The family background, school background, and financial support of the three students have been described and from the evidence provided, one can start to picture what it must be like to come from such circumstances. The poor

resources at school, lack of educational development activities within the home (also a consequence of financial need) and financial support in general, have effects on the 'capital' that these students are able to bring with them to higher education institutions.

6.3.2. Aligned cultural capital

Students in this category are considered to be well-resourced all round. All aspects that are considered to make important contribution towards building the 'right' cultural capital - parental empathy, language of instruction, the learning space or own room, reading books and computers are easily accessible in the home or at school are adequately provided to these students. As mentioned earlier, in a society like South Africa, there is still a stark difference between those who have the resources and those who do not have them. The students who fall in this category are Claire, Kathryn, Kenny, Siphon, Shane, Cheryl and Emma. Claire and Siphon are both international students from neighbouring countries and had attended the best schools there. Claire went on to do her A-levels, while Siphon did first year of BSc before coming to South Africa for an engineering degree. Kenny had attended a well-resourced private school, while Kathryn, Shane and Cheryl had attended formerly Indian-only public schools; Emma attended a formerly-coloured-only public school. Although the types of schools that these students attended differ, their families had provided them with the key indicators of cultural capital. Each student in this category has at least one parent who has had first-hand experience of a higher education institution; and each one of them has a separate room at home. They are all first language English speakers and the schools they had attended use English first language for teaching. Some of them have bursaries to pay for their education, while others have parents paying for them. During interviews, students provided substantial evidence to illustrate the added advantages that they had gathered before they came to university and this is provided below.

Home

Parents of the students in this category are in a better position to provide empathy to them. For example: both of Kathryn's parents are medical doctors;

Kenny's father is an entrepreneur who also has a PhD degree and often came as a guest lecturer to the university; Shane's father is an engineer; Emma's father studied chemistry and both of Claire's parents are university lecturers. These parents are in a better position to offer support and to be more understanding of their children's experiences at university because they have had first-hand experience of it. These parents are more likely to be very involved and want to know the progress of their children. When Claire talks about her parents' involvement she said:

They're almost too involved [Laughs]. My mom is French, my father lectures engineering mathematics, of course he is an engineer by profession, but he lectures engineering mathematics at the university...Well always, even my dad was here last term I think, I mean he came down and insisted on seeing my lecturer and sat with her to find out how my grades are.

(Claire's interview)

Kathryn, Kenny and Cheryl also talked about the support that they get from home. Kathryn mentioned that education is highly regarded in her home and that her parents encourage her. Kenny shared the same sentiments by mentioning that his parents regard education as highly important regardless of any discipline that he might have chosen. Similarly, Shane, Cheryl and Emma's parents all feel that it is very important for their children to get educated and the parents are doing what they can to give support to their children.

Privacy, especially during study times is respected at these students' homes. These students each have their own rooms where they can spend their private study time with very few interruptions. Some students, like Cheryl, still prefer to go home and study there during study week:

I am going home during study week. 'Cause you know it is not like you study with my room mate, it is different there. I know the house will be silent. And I have good food, proper food; you know you get so hungry when you study. So I know I can get proper work done at home. And I will like always have my parent behind me so I can't slack, that's the thing.

(Cheryl's interview)

Cheryl is not the only one who feels comfortable studying at home; both Kenny and Shane stay at home and travel to university daily. Shane mentioned that he is very fortunate to have his parents who respect and support his study time.

Ja I have enough space, I've good parents, good home and I think this is good for me... They are very supportive, both of my parents.

(Shane's interview)

The students in this category are not new to computers; most of them have computers at home and at school. Most of the students mentioned that they do read extra-curricular readings and watch various educational channels such as the Discovery Channel.

I watch things that are related to science documentaries, and stuff. Things that are telling you that some people are doing something interesting somewhere, ja those are the kind of things that I like.

(Sipho's interview)

Sipho said that those kinds of educational programs were very informative and encouraged him to think. He said he always found something interesting to learn from them. Kathryn found that extra reading throughout the years perfected both her English writing and speaking skills.

With the kind of support of their parents who also provided educational resources at home, this group of students becomes more advantaged in terms of the cultural capital that they brought with them when they came to university. While students in the non-aligned cultural capital category were introduced to computers for the first time and were challenged with lots of reading, the students with aligned cultural capital were ready to focus on higher demands of the curriculum requirements.

Schools

Starting with the two international students, when Sipho was asked about his former school before the one year of BSc, he mentioned that he attended the

best school in his country. He considered himself very fortunate to have been admitted to that school. When he was asked about the facilities, he mentioned that all the facilities were there. He said they had a very well-resourced library, but he preferred not to use it because everyone used it. When Claire was asked about her school's library, she said that it had everything that she needed at that time:

It was fully stocked, the library had past papers from I don't know I think 1987 and books, teachers were always there as well and the labs we had practicals every week in physics and chemistry...

(Claire's interview)

Claire is a first language English speaker and mentioned that apart from the added advantage of doing A-levels, she found no difficulties in understanding her school work and in writing reports. She said to her, most of her first year courses were repetitions of what she had done the previous years. Siphos is not a first language English speaker, but he was strongly encouraged to do his best in English at school. He said he had very good teachers who encouraged him. In his spare time he reads a lot of novels, which sharpens his English writing and speaking skills.

Kathryn attended a 'girls only' private school. She mentioned that her school was very well-resourced; it had everything from well-resourced library, experimental laboratory, good sports fields, and computer laboratories 'to the best teachers that money could buy'. She mentioned that if a teacher was questionable s/he was dismissed. Similarly, Kenny attended a well-resourced private school with all the resources that are considered important in his education.

Contrary to these four students, Cheryl, Emma and Shane were not quite as positive about their former government schools. All three students were not happy about the role their schools played in preparing them for university. Students blamed various aspects of the school, ranging from lack of resources, poor teachers' performance to 'off' communities in which the schools were

situated. Of the three students, Cheryl had the strongest criticism towards teachers at her former school:

It is a public school. It is bad. They don't really care. They don't get their work done. Lots of people go to extra classes outside the school and pay for it. Like our physics teacher was like useless. He used to whisper and didn't even explain properly and he used to confuse himself. So I used to go for extra lessons for it elsewhere...Like in mathematics we didn't finish our syllabus, English we didn't finish our syllabus, physics we did, and our computer studies teacher didn't know whether she was coming or going. We had pretty hectic teachers.

(Cheryl's interview)

In terms of resources available, she mentioned that they did have a library and experimental lab and in addition to this, the school had a computer lab. However she felt strongly that things were not organized and teachers were generally uninterested.

Shane did not think that his high school was a good school either. He said that he only went to that school because it was closer to home.

I don't think it was a good school, but just that it was in the area, it made it easier to get to school in the morning. My school was a local school. Well there were good results, but I wouldn't say it was a good school. The education was good, the way they teach was good, but the students and the surroundings were a bit off... A laboratory, yes we had one. A library, yes it was there, but I don't think anyone used it. People used the local one.

(Shane's interview)

He later mentioned that the library at his school didn't really have the material that he needed. From Shane's statement, it sounded as if the school itself was not a bad school, but that the community where the school was a bit unsettling, probably owing to violence and crime.

When Emma was asked whether she thought her previous high school was a good school she said:

Well it wasn't one of those white schools as they call it. It was a normal school. I think it was a good school, even though we did not have all those extra-mural activities like tennis and that stuff. But in terms of the work, it was the same standard as any other high school. The teachers were good really.

(Emma's interview)

Emma further mentioned that the school did not have a library. She said the school had an experimental lab, but they did not use it; they performed their experiments in class. When asked whether she thought the school prepared her for university, she said that her school failed to prepare her for the harsh reality of not having personal relationships with the lecturers.

The students' perceptions of their schools in this category are not as clear-cut as in the other categories. Some students felt that the schools did not prepare them for university and they clearly gave varying reasons why they felt this way. The reason these students feel that their schools did not prepare them enough might be because of their middle class family backgrounds, which gave them certain expectations and views about schooling in South Africa. However, these students are still classified as having aligned cultural capital because the key indicators of cultural capital are actually provided adequately by their schools and families. However, both Claire and Sipho felt that they were well prepared for their first year because of their experiences at the 'post-matric' level. Claire felt that having done A-levels had given her added advantage because she was taught that learning by understanding is very important. When Sipho was asked whether he thought he would have been prepared before the year he spent studying BSc, he said he would definitely have not been prepared.

Students in this group came from well-resourced good schools. Their parents show general support and involvement in their studies and they are in one way or the other supported financially. These three important aspects form the core for providing the student with the cultural capital that they needed when they came to university.

Financial support

The students in this category seemed to be well supported financially. Claire, Kenny and Shane's parents pay for their fees fully; Siphon got funding from the government in his country while Emma and Kathryn each have a bursary from local energy and research companies. Claire was fully aware that although her parents can afford to pay for her, she needed to think for them and to remember that they did not earn much in her country. She said she had to be consciously reminded that she could not afford to fail courses as this would be costly for her parents. Kenny mentioned that money was not an issue and that his parents were fully committed to paying his fees. Although Kathryn has a full bursary, she indicated that her parents could afford to pay for her even if she did not receive a bursary. Siphon comes from a slightly different background in that his parents would not be able to pay the full fee amount, but this is not a problem since the government pays. Emma had a bursary from an energy company, which paid for her fees and living expenses. However, she was concerned that if she failed her year, she would lose the bursary.

Some students in this category feel confident that they had all the resources that they need to succeed in their studies. They had all essential textbooks and other learning material, which they thought made studying easier for them.

I think I have all the resources that I need to make it, ja and here there is internet at my disposal and a library full of books and there are a whole lot of facilities to help me pass my first year.

(Siphon's interview)

6.3.3. Cultural capital and success in the course

At the end of Chapter 6, we already noticed that the construct of approach to learning was limited in explaining the success of students who adopted a strategic approach to learning. Table 6-2 is an extension of Table 5-2 to include students' cultural capital, which was ordered according to their approaches to learning. Of the 6 students who use a strategic approach, table 6-2 shows that the three students with aligned cultural capital passed the

course, while the two students who failed are two of the three with non-aligned cultural capital. Ntsane is the only student with non-aligned cultural capital who passed the course, however he performed lower than his counterparts who used a strategic approach. The findings presented in Table 6-2 suggest that a student's cultural capital influences their performance in the course.

Table 6-2: Cultural capital and students' success in the course

	Approaches to learning		Cultural capital category	Passed CHE1004W	Pass mark
	<i>Earlier</i>	<i>Later</i>			%
Claire	Deep	Deep	ACC	Yes	80
Sipho	Deep	Deep	ACC	Yes	67
Arabang	Deep	Strategic	NCC	No	42
Kenny	Deep	Strategic	ACC	Yes	68
Kathryn	Deep	Strategic	ACC	Yes	77
Kagiso	Deep	Strategic	NCC	No	45
Ntsane	Deep	Strategic	NCC	Yes	56
Shane	Deep	Strategic	ACC	Yes	66
Cheryl	Deep	Surface	ACC	No	41
Emma	Surface	Surface	ACC	No	45

6.4. Conclusion

This chapter started by outlining key indicators and categories of students' cultural capital. Then evidence was provided to support why each student was located within a specific category. At the end of this chapter, the results presented in Table 6-2 suggest that cultural capital is able to explain why some students who adopted a strategic approach passed and why others did not pass.

Chapter 7

Discussion and conclusion

Chapters 5 and 6 provided an analysis of students' approaches to learning and cultural capital respectively. Discussions around specific results in each of the chapters have already been presented. Thus, the purpose of this chapter is to provide a general discussion and to suggest implications of this study. The first section of this chapter provides a discussion around students' approaches to learning. This is followed by a discussion around students' cultural capital. Then the implications of the findings from each section are given in section 7.3. This chapter ends with a conclusion to this study.

7.1. Students' success and approaches to learning

The findings about students' approaches to learning

Chapter 5 presented the approach to learning results of each of the 10 students interviewed in this study. The summarized results given in Table 5-1 showed that students generally shifted from predominantly using a deep approach at the beginning of the course, to adopting a strategic approach towards the end of the course. This general shift towards a strategic approach ties in very well with Entwistle and Ramsden's (1983) findings that students can show a high level of both deep and surface approaches.

During the individual interviews, each of the students gave reasons why they approached their studies in the way they did. Their reasons were based on their perceptions of the course requirements, assessment tasks, the workload and their perceptions of what is expected of them. This ties in well with Ramsden's (2003) model of learning in context (refer to Figure 2-1), that students' learning outcomes can be traced back to their approaches to learning and that these approaches are not 'fixed' but are derived from an interaction between their orientation to studying and their perceptions of the context of learning.

Although students used various approaches at various times, the one aspect that emerged as common to many of these students was that time was limited. Some students who shifted from using a deep approach to a strategic approach mentioned that they did not have enough time to engage fully with concepts because they have high workload from various courses. The importance of students' perception of time in the learning context is not a new finding. Case and Gunstone (2003) had earlier found that even students who used a deep approach found time to be an issue, but they managed it better than other students.

To elaborate on this finding, one can notice that students' perception of the learning context is a very important influence on the approach to learning that they use. For example, assessment requirements can force students to use a deep approach. However, there is a big battle that may hinder students from engaging with a deep approach, and this is students' perception of time. Although the assessment requirement of a course may be designed to encourage a deep approach, students with a high workload will continue to find it difficult to find time to engage with the material at that level. As a result, students will continue to look for ways to 'survive' and use whichever approach they feel allows them to do so.

Does the approach to learning construct explain students' success?

There are two important findings regarding the link between an approach to learning and students' success that this study has highlighted. The first finding was that out of the students interviewed, those who maintained the use of a deep approach throughout the year passed the course. The students who used a surface approach at the end were not successful in the course. This finding suggests that the course requires students to engage with the material at the level above a surface approach and that a student who adopts a surface approach alone cannot meet the requirement of the course. On the other hand, the second finding suggests that the success of a student who adopts a strategic approach - the use of either a deep or a surface approach depending on one's interpretation of the context - can go either way. This finding

suggests that although the construct of learning approach has been a useful tool in determining the success of students who adopt either a deep or a surface approach, it has its limitations when determining the success of students who use a strategic approach. The construct cannot explain why three of the seven students who adopted a strategic approach failed the course while the rest passed. An explanation to this might be that some students might be poor strategists in judging which approach is appropriate for a given task. A good strategist might be able to judge what is required, and then decide on an approach that might work best. It was noticeable that the two students who used a strategic approach and failed the course came from disadvantaged schooling backgrounds. It is for this reason that the construct of cultural capital was used to further explain students' success, especially in this situation where the approach to learning was limited.

7.2. Students success and cultural capital

The findings about students' cultural capital

In Chapter 6, issues regarding each student's cultural capital were discussed. Students were categorized into either aligned or non-aligned cultural capital groupings. As a reminder to the reader, aligned cultural capital is closely aligned to the evaluative standards of a higher education institution while the non-aligned cultural capital is the opposite. The five key indicators of cultural capital were: student's language competency, parental empathy, motivation to reading/types of reading, availability of private learning space in the home, and availability of a computer. These indicators were used to demonstrate the varying degree of experiences between students with aligned and non-aligned cultural capital.

Does the construct of cultural capital explain students' success?

When cultural capital was used to evaluate student's success, it emerged that a student with non-aligned cultural capital performed poorly when compared to their aligned cultural capital counterpart. The link between students' success and their cultural capital has provided a useful insight into what might be seen

as a 'flaw' in the evaluative standards of our educational system. As Bourdieu (1977) suggested, the evaluative standards of our institution may be asking of everyone alike that which is not equally distributed to everyone. In the South African context, cultural capital plays an important role in explaining the differences between performances of students from various social classes (hence various schooling backgrounds) because of the persisting inequalities between different social classes.

To elaborate on what is meant by the institutional evaluative standards above, let me give an example of two students who come from two different social class backgrounds. One student is encouraged to read at home and is exposed to various types and amounts of reading. The second student comes from a family where reading is not part of the cultural activities encouraged. This student leaves books at school because teachers are afraid that the books will get ruined at home. While the first student participates in what may lead to academic success, the second student does not get this opportunity. De Graaf et al (2000) found that reading is associated with academic success and this is due to the 'educative resources' such as analytical and cognitive skills which develop during reading. Later on when the two students are at university, the same level of reading and interpretation is immediately expected of them as if they both had had exposure to the same forms of reading.

Equally important, a student who is not a first language English speaker who has never used a computer, who never did any experiments at school because of lack of resources, cannot be evaluated as though he/she had had all these resources. In other words, the evaluative standards at entry level fail this student if they fail to recognize that which is different about this student. There must be a way in which the evaluative standards at entry level can be improved to be fair to everyone, regardless of their previous educational backgrounds.

When one looks at the success of students who use a strategic approach in terms of their cultural capital, it becomes evident that the choice of a particular approach may be influenced by the students' cultural capital. By this I mean

that students with non-aligned cultural capital may go into a situation whereby they wrongly choose to use a surface approach instead of a deep approach because of the cultural capital that they have. By contrast, students with aligned cultural capital are able to recognize which approach is best suited to a task at hand.

7.3. Implications of these findings for practice

The core motivation of this study was to find ways for explaining students' success in their first year engineering course, with the hope that better understanding would lead to informed interventions for better success rates. Therefore, the implications of this study are firstly for the context in which the study was conducted. However, there are other implications which are of greater applicability to other first year engineering courses and the undergraduate programmes at large.

Implications specific to the context of the study

The first implication for practice arises from considering that the course aims to encourage students to engage with the material preferably using a deep approach to learning. However, it became evident during interviews that somehow, many of the students shift from using a deep approach to using a strategic approach. Although the strategic approach may lead to success (if correctly applied), this raises a concern that there might be other aspects of the course that elicit the use of a surface approach. Having said this, it must be acknowledged that the course has been able to discriminate very well between students who use either a deep approach or a surface approach consistently and this was seen when students either passed or failed if they used either of these approaches. Efforts to encourage and to reward the use of deep approaches should continue in the course. However, the challenge to this course is the issue of workload, not only within the course, but maybe the workload that students continue to carry affects how they engage with their course material. Hence the curriculum as a whole should work towards reducing the workload, if the aim of encouraging deep approaches is to be fruitful.

The second implication of this study concerns the assessment strategies that this course uses. The course aims to encourage a deep approach to learning, and by doing this it uses embedded questions in the real world contexts (e.g. Part B of the homework assignments) which carry extensive written texts. Other assessment tasks such as the book review and plant visit reports require good reading and writing skills. The details embedded in the text might unintentionally be excluding students with non-aligned cultural capital. This 'exclusion' may not even allow them to engage with the material at all as they struggle to interpret what they have been asked. As a result, students who come into university with these skills tend to perform better in the assessment tasks. As Tamsin Haggis puts it -

This move reconceptualises the idea of 'barriers to learning', attempting to understand how more subtle aspects of higher education pedagogical cultures may themselves be creating conditions which make it difficult, or even impossible, for some students to learn.

(Haggis, 2006, p. 521)

It might be helpful to be explicit about what is required of the students without giving them answers. Although being very clear of what is required might not interest those who have aligned cultural capital, if not done, it excludes those who have the non-aligned form of cultural capital.

The general implication

It might be useful at this stage to clarify what is meant by being explicit. It is not implied that the curriculum has to 'dumb down', but rather that the curriculum needs to be 'responsive' towards students with various forms of cultural capital. Rather than the institution asking students to be 'fixed' in their first year, it might be useful for the institution to re-evaluate itself, the curriculum and evaluative standards to make explicit to everyone that which the institution implicitly demands of everyone.

To conclude this section, I would like to refer to the words of Terry Volbrecht and Chrissie Boughey in their chapter on 'curriculum responsiveness' in higher education in South Africa:

Academic Development professionals often took the position that students from historically disadvantaged backgrounds entering tertiary institutions drew on different forms of cultural capital to those of mainstream white students. The ability of the curriculum and teaching methodologies to acknowledge and build upon that cultural capital was thus considered crucial...

(Volbrecht & Boughey, 2004, p. 63)

Unless the institution re-evaluates itself, its evaluative standards, and acknowledges the diversity of its student body, we might continue to be faced with inequalities in the success rates of students for many years to come.

7.4. Conclusion

This chapter presented the general discussion of the results from the previous chapters and drew on the literature review in Chapter 2. From the discussion, it can be concluded that the course does encourage students to adopt a deep approach to learning; however there may be aspects of the course context that promote the use of a surface approach. Furthermore, it was also observed that approach to learning was limited in explaining the success of students who use a strategic approach. At that point, cultural capital became a very useful tool in explaining the success of these students. One can say that the major contribution of this study has been the use of cultural capital to explain students' success in the course, especially at the times when our education system faces challenges of inclusion, access and throughput. The implications that arose from this study challenge the current thinking within our educational system that it is students who must change rather than the institution.

Appendix A: The short Approaches to Studying Inventory

Name:.....Student number.....

Father's Occupation..... Mother's Occupation.....

Approaches to Learning and Studying Questionnaire

Fill out this questionnaire, relating your answers directly to your experience of studying at university. Please give your immediate reaction to every comment, indicating how you really did study.

Put a cross in the box to indicate how strongly you agree with each of the following statements

✓=agree ✓?=agree somewhat ??=unsure *?=disagree somewhat ×=disagree

Try not to use ?? unless you really have to, or if it cannot apply to you.

✓ ✓? ?? *? ×

1. I often have trouble in making sense of the things I have to remember.
2. I go over the work I've done to check my reasoning and see that it makes sense.
3. I usually set out to understand for myself the *meaning* of what we had to learn.
4. I generally put a lot of effort into my studying.
5. Much of what I learned seems no more than lots of unrelated bits and pieces in my mind.
6. In making sense of new ideas, I often relate them to practical or real life contexts.

7. On the whole, I am quite systematic and organised in my studying.
8. Ideas I've come across in my academic reading often set me off on long chains of thought.
9. I look at evidence carefully to reach my own conclusion about what I'm studying.
10. When I communicate ideas, I think over how well I've got my points across.
11. I've organised my study time carefully to make the best use of it.
12. It is important for me to follow the argument, or to see the reasons behind things.

13. I tend to take what we've been taught at face value without questioning it much.
14. I try to find better ways of tracking down relevant information in this subject.
15. Concentration in class is usually not a problem for me, unless I've been really tired.
16. In reading for this course, I've tried to find out for myself exactly what the author means.
17. I've just been going through the motions of studying without seeing where I'm going.
18. If I've not understood things well enough when studying, I've tried a different approach.

19. I spent a lot of time learning my work by myself at school.

20. My school teachers adequately prepared me for University.
21. I had all the textbooks/resources that I needed to succeed in my studies.
22. English was never a problem for me in doing my high school work.
23. I didn't try to understand everything I was taught, I just applied a formula that worked.
24. I could learn my work the night before the test and still get a mark above 70%.
25. My family supports me in every way they can with my studies.
26. I don't have to worry about paying for my fees, someone is already paying for them.
27. I feel safe to talk to my parents about my experiences and problems that I have.
28. Should the need arise, I will feel safe to approach someone about my problems.

Adapted from ETLQ 2002, ETL Project, Universities of Edinburgh, Durham and Coventry (<http://www.ed.ac.uk/etl>)

SCORING the Approaches to Learning and Studying Questionnaire

Enter the score from each question in the block alongside the question number, then add up the scores in each column:

	DA	SA	MS	OT	EM
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
TOTALS					
	Divide by 30	Divide by 20	Divide by 20	Divide by 10	Divide by 10
Final score:					
	Deep Approach	Surface Approach	Monitoring Studying	Organisation & Time	Effort Management

Appendix B: Example of a 2006 homework assignment

Student number:.....Surname:.....First name:.....

UNIVERSITY OF CAPE TOWN
DEPARTMENT OF CHEMICAL ENGINEERING
CHE1004W Engineering I

Homework Assignment 7

Do your **OWN** work in answering these problems. Any evidence of copying will result in zero for the submission (for both people) and the possibility of forfeiting your DPR for the course. Write your name and student number clearly at the top of this page. Answer **ON THIS PAGE** and hand it in. If you need more space write on the reverse side of this page, but clearly indicate 'P.T.O' at the bottom of the page.

Due: **Wednesday 9 Aug 9h00** - Hand in at the **start** of the CHE104W lecture. Please suggest a date, this is a holiday.

Part A

- 1) An ethanol stream is preheated from 20°C to 70°C before entering a process unit, by heat exchange with saturated steam at 1 atm. If the steam is condensed to liquid water at 95°C and the flowrate of the incoming ethanol stream is 1000 kg/h, what steam flow rate is required? Assume that the process is well insulated and there are no heat losses to the surroundings.
Given: C_p (ethanol) = 120 J/mol. °C; M (ethanol) = 46 g/gmol

Part B

- 1) Without a numerical calculation, what do you think will happen to your flowrate of steam if only:
- The incoming ethanol stream has a flowrate of more than 1000kg/hr,
 - The 1000kg/hr ethanol stream came in at temperature much higher than 20°C.

Give a logical explanation to your answers in a. and b. above.

Appendix C: Interview timesheet

Students' interview schedule and specific ASI statements to focus on

	Student	Date	Time	Specific ASI statements focused on
1	Claire	Tue 3rd October, 2006	12:00	1,3,5,6,8,9,12,13,16,17
2	Sipho	Wed 4th October, 2006	14:00	3,6,8,9,12,13,14,16,18
3	Arabang	Fri 6th October, 2006	12:00	3,5,6,7,13,16,17
4	Kenny	Wed 18th October, 2006	12:00	1,5,7,8,11,13,14,16,19,20,23
5	Kathryn	Fri 20th October, 2006	12:00	3,6,8,9,10,12,13,14,22,24
6	Kagiso	Wed 4th October, 2006	12:00	1,5,13,17,
7	Ntsane	Fri 6th October, 2006	15:00	1,5,6,7,8,9,16,17,21,22
8	Shane	Wed 4th October, 2006	13:00	1,2,3,8,9,13,14
9	Cheryl	Thurs 5th October, 2006	12:00	2,3,4,5,8,9,10,11,13,14
10	Emma	Thurs 5th October, 2006	13:00	1,2,3,4,9,11,12,13,14,16,17

Appendix D: A sample interview transcript

Ntsane's interview

Friday 6th October 15:00-15:45

Let's look at the first 1 "I often have trouble in making sense of the things I have to remember".

Not a trouble right, but sometimes I do have trouble but I mean the real problem is trying to remember something, I think remembering is another thing. Remembering is like cramming something but you have to understand the thing...I think what makes things difficult to remember is pressure, not being able to come back and do the things again. When I do something today I have to go through it today or else the next day I have to proceed to something else. So actually I don't get enough time to come back and study the things that I've studied again.

So, but then if you learn something and you know it do you really have to remember it? Or when you know it you just know it?

Well I don't know. Like you see, knowing is another thing. Knowing for me is just saying I know this thing and I definitely won't forget it, no matter what I am from now on I won't forget it.

Give me an example of what you are talking about.

Like I know my name and I won't forget that.

Ja you will not forget your name.

Ja, it is something that I know.

You also do know for example, you know the gravitational acceleration, that is 9.81, and you don't need to remember that.

Ja, exactly.

Actually I didn't understand the point of asking me this, because when you talk about knowing and the way I define it is another thing, that's why I say knowing is something else like I've already said, it is something that you cannot forget. Knowing something is like not forgetting it regardless.

You know the reason why it is important to sit down with someone and check their understanding is because sometimes someone didn't really understand what was asked and people may be understanding the same sentence differently. That's why it is important for me to understand what you meant when you ticked, or rather agreed on this statement.

Number 5 "much of what I've learned seem to be no more than lots of unrelated of bits and pieces in my mind".

Like the way I understood it is like this, like comparing chemical engineering to other courses, it is the only course that is linked to other courses, ok like it does link to mathematics and physics and chemistry, but the thing that I learn in physics are unrelated to others so it is just about problem solving. Sometimes I feel that it is

unnecessary though it is necessary. The way I understood it was like ok comparing other courses, do they really form the part of good chemical engineering.
So when you talk about much of what you learned you are talking about relative to other courses.

Ja

Not like specifically in one course.

Ok, another thing about the book, some things that you learn in the book are not relevant to what you are learning in class, so it is like you cram those pieces but you are not going to use it in class, it is just for general knowledge.

Alright.

Let's look at 6 " in making sense of new ideas, I often relate them to practical real life experiences".

The first time you agreed, but the second time you disagreed.

Well most of the time when I solve problems I no longer solve them the same way as I used to, I know longer look at the question and start to think about it the same way as before. Most of the time I look at the question and see if it is similar to something I have done before then start to do it, and get the answer then I am done.

Ok that's how you do it now..

Ja that's how I do it now.

How did you do it before?

I used to get more understanding of the question, like visualize it, but now you don't have much time in exams to visualize everything and start writing it down so you just have to write the answer the way you've seen it before and relate it to something you've seen before.

What if you have seen anything like it before?

That's were you start thinking and then draw the diagrams.

But generally now you have moved from trying to understand the question to just doing it as fast as you can and relating it to something else...

Ja.

Ok, but does that still make you pass?

Ja, I guess it does make you pass, but not that much. Actually what it does is it makes me finish on time. Otherwise I would finish late trying to figure out something that I may not figure out within the time I am given, maybe I figure it out later with my friends. But at that time you need to do it quickly and if it does quickly come in your mind you need to go on and write what you can.

Do you think if you had more time, like if a 1 hour test was made two hours, what do you think you could have do with that? You are saying now that it is a question of time, what would you then do with that time?

Well it also depends on which time. If I had more time to study these concepts and understand it, I would be more relaxed about understanding the questions in a test.

But right at this time do you feel that you don't have enough time to study the concepts?

I feel like I do have enough time, but what happens is that we are different, I've lost the touch of managing time, I've tried to manage it but at the end of the day I've been bitten. I think I've been worried about managing time a lot of times. I am still worried about time now. I mean I am writing a chemistry test soon and I haven't started studying for it.

When are you writing it?

Next of next week...

So you are saying the real problem is not being able to manage the time?

Ja,

How come you are not able to manage your time? How come you don't have a time table? Do you have a timetable?

Yes, I do have a time table, but sometimes when you studying something you are enjoying it from the book, comes the questions you are trying to do the questions then you get stuck and get frustrated and you feel like an idiot so these are the kind of things that de-motivate you. That's why you start to lose track of your time. Like you can be de-motivated by one question then you can't really move on to others while you are de-motivated. Sometimes, I start feeling stupid like I should have known this thing.

And then that's where you stop..

Ja, that's where I stop and try and relax.

Do you study alone?

Ja, that's studying, but doing questions, most of the time I don't do them alone. Ok sometimes I do them. Ok I am a bit motivated these days. I do them and those that I can't I go ask someone.

Where do you stay, res?

I stays in Smuts

Ja I guess it helps sometime to do things with other people, because when you get frustrated and leave things as they are, it doesn't mean that later on when you come back all your problems will go away...

They do go away..[he laughs]

I mean I didn't think I'd still be here after first semester and I am still here. So they do go away.

Is this your first year here?

Ja it is my first year.

Why do you ask me that?

Just asking [both laugh]

Which high school?

St Matthews in Soweto.

*Tell me more about the school itself. Would you say it was a good school?
Matric % pass.*

Well in matric I didn't have to work hard, like for my biology exam, I could study the night before still got good marks, which didn't expect actually. But high school was nice. I do remember it.

Were things easier?

Ja, compared to what first year has been it was a lot easier. Well there we had a bit of discrimination, so one had to prove a point, even though I was a bit of a genius, but there was this girl that I didn't like, she just boosted my spirit. She used to get 100% on physics June exams so I felt like if someone can do it so can I.

So what changed?

Just work, actually nothing has changed except lots of work that they cover here. Lot of work. Ok during first semester I was relaxing, I didn't really do much then, but during the second semester I realize that if I don't pull myself together I am gonna fail. Now that I've put a lot of effort in my studies, I am no longer being as stressed as I used to.

How was your first semester?

My first semester was horrible, horrible. I failed mathematics, I mean my first time when I failed mathematics I was like no ways I don't believe this. This was like a shock of my life.

So first semester you were not studying?

I was studying, but the thing that I studied most was chemistry. You see when you pass something you become motivated to study it. So that's the thing, that's why I studied more chemistry. But the mathematics ja...ok the other thing is that the time

that I wanted to study, I didn't have the books, I didn't get the book so quickly so I started, everything just started to go down because I didn't have the book and so on. So I had to struggle to get a book that's why I was left behind. So ja, then after that when I get the books I had to cover lots of chapter and you know covering up is not really easy.

So you have books now?

Ja, I do have books, but covering up is not a joke.

Yes it is not.

Ja, your teachers at school, do you think they prepared you enough?

No ways they didn't. especially about the practicals, I was talking about the practicals I even told them, the things they used to do like they would do the practicals and then write the information on the board so all we did was to go there and copy the information, whatever they gave us.

About assignments, I don't remember getting any assignments, high school I didn't even know there things like assignments. So I don't think they prepared us.

Um in terms of the way they taught you. Is it different from the way they teach you here?

No, ok in terms of the way they taught me, well lets not put it that way..in terms of the way I taught myself cause I wasn't relying on teachers in high school. I was just like doing my stuff. I could sit at the corner and make noise but at the end of the day I knew I could still work and get an A. So ja I was doing my own thing, especially mathematics and physics, I did my own thing.

Ok, you guys didn't have labs..

Well we did have labs, but I don't know... I think it was just the system of the school, like they had different ways of doing things. Maybe they figured doing experiments will just waste a lot of time.

And then did you guys have a library at school?

Library, ja.

Was it user-friendly, did you ever use it?

I never used that library, for what? The only library I used to use was the neighbourhood library, because most of the time I used to go there and study. I feel good when I study in a library I don't know.

The thing is at home we had like two bedrooms, and my cousins and my brothers share one and there is like there is no table in the rooms. So the only place I could study would be in the kitchen so instead of studying in the kitchen, you know that you will be tempted to watch TV as others are watching or listening to radio, so you're not going to focus that much so I went to study in the library.

Were you.. how was the use of English at school?

Well I also have a problem with my English, me and English are two different people. Most of time it is not about English, but about my speech. Maybe sometimes I need to see a speech therapist or something.

Your speaking is perfectly fine to me...

Ja, with you, but when I go outside and speak with other people I don't know it just happens that I just lose words and maybe start using my home language. It does happen.

Ok. Ja lets go back to your school and the use of English. Were they teaching you in English, for example when they taught you mathematics and physics, did they try to...

Everything was taught in English except Zulu, but you know how it is.

So you had enough practice to speak English?

Ok, we did participate in class, but of course when you get outside you always talk your home language ja.

Ja, I know that part. So what symbol did you get for English?

I got B.

That's good.

Ja, do you watch TV and what programs do you watch on TV?

Like what programs will I find you watching if you were watching TV?

Ok, before I came to varsity...well ok most of the time I didn't stay much in the house. Maybe I would listen to the radio, but not much TV.

So what, you prefer radio over TV or.. or is it just when you are at home..

I prefer listening to radio. I like listening to my own music.
At home I would listen to y-fm. It was nice fresh and making some nice jokes.

And then books, any books that are not academic that you read?

I did read some books in high school because it was a must to read them.

Well I want to hear about things that it is not a must for you to do them.

I used to read news paper. I used to read Sowetan. I like gossip stuff in these newspapers like daily sun. They make you laugh you know.

Any kind of sport that you like?

In particular, I like soccer. I play soccer common I even asked for soccer boots from Brazil...

Ok lets move on. I think where were at 7. "on a whole, I am quite systematic and organized in my studies"

I think I've answered that. About the timetable and not following my timetable and the likes.

*But then why do you now follow your timetable? It is because of what you said?
About being demotivated when you cant do something...*

Ja, also some of us have to go through the staff many times before we understand it.
Ja you are right. But then when you are in a lecture, do you find it difficult to understand things there?

Yes, yes I do. I had to go back and study things in the book to get it. Lecture notes no. sometimes I go to the lectures just to pick up things, like in physics, I go to that I can remember how things were done while I am studying on my own.

But in terms of chemeng...

In terms of chemeng, ja you just have to do a lot of questions.

Ok. Let's look at 8. "Ideas have come across in my academic reading, often set me off on long chains of thoughts"

Actually I didn't get what the question was on about. I didn't understand the question.

I understand. It has to be hard for people who are not first language English speakers to understand what this statement. So even if you didn't understand it, don't worry about it.

Anyway, number 9 "I look at evidence carefully to reach my own conclusions about what I am studying"

Ja, I guess I do. Because when I read something from a book, I try to understand it in a way that I can explain it to someone else. That's how I get information and transfer it to other people. So I convert this information from the book and make it they way I feel comfortable with it.

Ok, but you had disagreed first time around. What were you doing back then?

As I told you like I didn't get the books on time so that why.

So you are saying that because of the book not being there on time, that also delayed your learning.

Ok 16 "in reading for this course, I've tried to find out for myself exactly what the authors mean"

No not really, well say when I read something from the text book, I just take it as it is, I don't try to disagree with the author or whatever. In such a way I take in information, but if someone comes up with something that may disagree with that information at the time, then that's were I open my mind and find out more

information about this thing. But if everyone say this is right I just say ja it is right. I just do it because I have to do it.

Ok. 17 "I've just been going through the emotions of studying without seeing were I am going"

Ja,
Tell me more about that.

Physics physics physics. I used to love physics, but now most of the time when I study it. I just do it just to get over and done with it. That's how I study it.

Tell me more about chemeng.

Ok, chemeng I don't know what happened during the June test. I just like lost it before I wrote. I told you, pressure! I just lost myself then. I just relaxed and relaxed and not studied until late.

So you didn't study chemeng?

Ja actually I didn't study chemeng that much. I did study, but not that much. And then I got burned, I got burned very very bad.

Can I just say something to you?

Ja.

You need to study.

I know.

I know you know that, but ja...

21 I think you've already mentioned that you didn't have all the textbooks. Well I know first semester when you started you didn't have the textbooks, but was it the same in high school?

No. it was not the same. They had the books at school, so you could just borrow them.

And 22

*"English has never been a problem for me in high school"
You are saying no. so are you saying it was a problem?*

It was a problem.

Tell me, now here you have to write reports and the likes all in English....

Ok lets say, sitting down and writing is different from talking. So when I am sitting down and writing I can make sense of it. When you are speaking it is a different story because you have to be alert to what you are saying.

So the real difference come when you have to speak it..

Ja. Writing is not difficult.

Ok, alright.

Tell me about your fees..are they paid for? And who...

My fees, well I am not sponsored. I am in Financial Aid. If I was maybe there would have been the delays regarding textbooks and stuff. You know when you ask for money from home and you are not there are delays and stuff, so you end up getting things very late.

And homework assignments. What did you think of them? Your experience about them?

I don't think they made any difference. Because, sometimes like you never even had time to do it, so you do it on Tuesday then you just submit it. So when you write it you just write it to get rid of it because you know that it is a DP requirement ja. So ja. So just like that.

So what do you think you could have changed if you could change your first semester?

I would change my attitude and the way I see things and the way I understand things. Like get more serious about my work then and correct were I did mistakes. Also try to be curious about the things you do. See if you are not curious about things you do, it is not because you are stupid or anything, but just because you are not curious about it, you just doing it for passing, then maybe one could have been a bit more curious about things being done.

I think attitude is a good place to start working on. Thanks a lot for you time.

Appendix E: Examples of data analysis tables

Table E1: Summary of Short ASI questions Ntsane

Statement number	STATEMENT	INV		Support 1	Support 2	My comment
		1	2			
1	I often have trouble in making sense of the things I have to remember	<input type="radio"/>	<input type="radio"/>	Not a trouble right, but sometimes I do have trouble but I mean the real problem is trying to remember something, I think remembering is another thing. Remembering is like cramming something but you have to understand the thing	I think what makes things difficult to remember is pressure, not being able to come back and do the things again. When I do something today I have to go through it today or else the next day I have to proceed to something else. So actually I don't get enough time to come back and study the things that I've studied again.	I have problem with the use of trouble, defines remembering as cramming. Knowing and remembering are different.
5	Much of what I learned seems no more that lots of unrelated bits and pieces in my mind	<input type="radio"/>	<input type="radio"/>	Like the way I understood it is like this, like comparing chemical engineering to other courses, it is the only course that is linked to other courses, ok like it does link to maths and physics and chemistry.... The way I understood it was like ok comparing other courses, do they really form the part of good chemical engineering.	Ok, another thing about the book, some things that you learn in the book are not relevant to what you are learning in class, so it is like you cram those pieces but you are not going to use it in class, it is just for general knowledge.	that what he learns link together at the course's level, not at a specific content level. The second explanation is at a content level. So he understood it differently at two levels in time.
6	In making sense of new ideas, I often relate them practical or real life contexts	<input type="radio"/>	<input checked="" type="radio"/>	Well most of the time when I solve problems I no longer solve them the same way as I used to, I know longer look at the question and start to think about it the same way as before. Most of the time I look a the question and see if it is similar to something I have done before then start to do it, and get the answer then I am done.	I used to get more understanding of the question, like visualize it, but now you don't have much time in exams to visualize everything and start writing it down so you just have to write the answer the way you've seen it before and relate it to something you've seen before.	time is an issue for him as well, it makes him change his ways.
7	On a whole, I am quite systematic and organised in my studies.	<input type="radio"/>	<input checked="" type="radio"/>	I feel like I do have enough time, but what happens is that we are different, I've lost the touch of managing time. I've tried to manage it but at the end of the day I've been bitten. I think I've been worried about managing time a lot of times. I am still worried about time now.	Yes, I do have a time table, but sometimes when you studying something you are enjoying it from the book, comes the questions you are trying to do the questions then you get stuck and get frustrated and you feel like an idiot so these are the kind of things that demotivate you. That's why you start to lose track of your time	he has lost track of managing time. At the same time, he gets frustrated if he doesn't get things right.

8	Ideas have come across in my academic reading often set me off on long chains of thought.	OO	X	Actually I didn't get what the question was on about. I didn't understand the question.	
9	I look at the evidence carefully to reach my own conclusion about what I am studying	X	X	Ja, I guess I do. Because when I read something from a book, I try to understand it in a way that I can explain it to someone else. That's how I get information and transfer it to other people. So I convert this information from the book and make it the way I feel comfortable with it.	As I told you like I didn't get the books on time so that why.
16	in reading for this course, I've tried to find out for myself exactly what the author means	OO	X	No not really, well say when I read something from the text book, I just take it as it is, I don't try to disagree with the author or whatever. In such a way I take in information...	...but if someone comes up with something that may disagree with that information at the time, then that's where I open my mind and find out more information about this thing. But if everyone say this is right I just say ja it is right. I just do it because I have to do it.
17	I've just been going through the motions of studying without seeing where I'm going	-	OO	Physics physics physics. I used to love physics, but now most of the time when I study it, I just do it just to get over and done with it. That's how I study it.	Ja actually I didn't study chemang that much. I did study, but not that much. And then I got burned, I got burned very very bad.
21	I had all the textbooks and resources that I needed to succeed in my studies	X	-	I didn't have the books, I didn't get the book so quickly so I started, everything just started to go down because I didn't have the book and so on. So I had to struggle to get a book that's why I was left behind	So ja, then after that when I get the books I had to cover lots of chapter and you know covering up is not really easy. Ja, I do have books, but covering up is not a joke.
22	English was never a problem for me in doing my high school work	X	XX	It was a problem	Ok let's say, sitting down and writing is different from talking. So when I am sitting down and writing I can make sense of it. When you are speaking it is a different story because you have to be alert to what you are saying.

Table E2: Summary of Cultural Capital data

Kagiso

Summary Points	Impression	Reason
1. Previous school		
Resources		He says that they did have library even though they did not use it. I realise that I did not follow up on this question to find out why he did not use the library. This could have been because he did not prefer to use the library or that the even though the library was there, it was not fully equipped with material that he may have needed. This also reminded me that having a library does not mean that it is a functional. Also, I did not follow up on the question regarding experimental labs. However my first guess would be that they may have lacked resources (I may be wrong, but the picture I am having of his school is similar to mine). it is a good public school, some good teachers, with under-resourced labs and, library and no computers. I will have to find out from him how true this is. I will contact him and find out from him.
library	O*	
Exp. Labs	O*	
Computers	X*	
Guidance class	-	
2. Family support		
Parents supportive and motivating	OO+	He indicated in both inventories that his parent (his uncle in this case) is supportive of his education. However, during the interview, he mentioned that no one contacts him to find out how he is doing. He even felt like they forgot about him and that they dont care about him anymore. Check what kind of problem you are suspecting this is.
Support from other family members	-	Kagiso mentioned that he only stays with his uncle and that he doesn't have parents. No mention that he is alone, with no other siblings. So it seemed to me that his uncle is his only source of support and that when his uncle is ill then there's no one else to support him. This must be very difficult for him.
Studying respected and encouraged	OO*	From what he told me, I assume that his uncle supports and respects his education. It may not be the support at the emotional level, but I think he does want him to be educated.
Comfortable talking to Parents		He indicated that he is not comfortable talking to his parents about his problems. This is why I think he is supported, but not to the level where there is complete openness and emotional support. I think I understand the type of support his uncle gives. With other cultures like mine and very much like his a man who needs an emotional support/ understanding is showing signs of weakness. In other words, it is not common to find relationships where two men talk to disclose their feelings to each other. This is does not happen a lot. This is considered western, not african.
Resources such as Computers available	XX	From his family background, I woud'nt expect him to have computer at home.
3. Language development		
First language	Sesotho	
First language at shool	Sesotho	
Did/does extra reading		He mentioned, he does not read a lot generally. He prefers to read his school work and not much else. A C-symbol second language indicates that there is a lot of room to improve. At the same time, I don't think his school did a lot of good by using Sesotho primarily as a means of communication. But he seemed not to have any problem with how he was taught at school. He says that he doesnt experience many problems with his English here, but that is still to be seen.
Matric English symbol	C (2nd lang)	
4. Financial Support		
Fees paid by	XX	He has Financial Aid, however he still has an outstanding R7000 family contribution that is not yet paid. This says a lot about his financial situation. In a way, his uncle will have to pay it or else he may not be able to register next year.
other resources paid by	-	I think his uncle tries to make other resources available to him, but he mentioned that his uncle has two children of his own to take care of.
5. Other		
Teacher's contributions	OO	He is quite positive that his teachers prepared him enough, except one teacher, his physics teacher.
Overall perception of his former school		I think he is happy with his school generally. He believed that they'd done their part. He doesn't complain about the school, however he points out that UCT is not quite what he expected it to be. He says it is harder than he thought

Table E3: Summary of students' perceptions of homework assignments

Interviewee	Attitude	General experience	Part B	Another comment	What can be improved?
Atabang		They were not ok. I struggled a bit, but they were actually helpful, cause when the test came you were ready, you go through them before the test and they did prepare you for the test. Some of them were quite difficult and some where not so... but most of the times like first semester homework assignments I did them like the day before we submit them. So it was actually cheating and just writes them to submit them. But second semester they were not that bad.	Part B was always the killer. I mean it always forced you to think deep. But I think it was good that way.	They actually do prepare you for tests. 'cause most of the time, the very similar question would come in a test, so if you did them you are better prepared.	
Claire	++	They were quite ok...ok most were doable.. um they are useful because I know if I don't have work to do it would be very hard to motivate myself...so if you have a homework assignment it may take you that two hours to get to do it, so which is a good thing.	The Part B, I didn't mind Part B, they asked you to analyse what you did and I didn't have a problem with that...Part B reminds you that ok this is a condition, so you want to be able to do that at other conditions. In a way it reinforced what you did in Part A.		...like I think we should have more feedback...get feedback on how well we do and I think that it is important to know how well someone does relative to the class, it could help. The actual content is fine
Cheryl	++	They were helpful in terms of doing the work, and going through it...Like you know if you didn't understand the concept from class, it forced you to learn how to do it. Because it asked to you explain why this and that happens it forced you to learn it	Part B made you think...it really forced one to think, I mean there were no direct or specific answers so ja.		I don't know, I think it should be made for marks, I think people would take more concern in getting it done...think that feedback would be very helpful

<p>Emma</p>	<p>+/-</p>	<p>Well they were ok, except Part B...I don't know, cause some of the things I was asking myself why do they ask me this. Well I know that they are intended for me to do them at home and say what I think, but most of the time I said well I don't know what to think. Do you think I care?</p>	<p>No I didn't like Part B</p>		<p>Remove part B. they were ok just remove part B.</p>
<p>Kajiso</p>	<p>++</p>	<p>Ja, they helped a lot, ja because they cover much of work done in class and the reasoning in part B gives you an idea of what you are doing and sometimes you are given a problem that is real and you can feel it, but you just go and find out that the way you've reasoned shows that you are reasoning like a chem. Eng...Ja, they helped me a lot in the way I think, I have to look out and make sense of things through understanding.</p>	<p>Part B, especially, that's where the problems, that's where I was stretched to think and understand...it helps you to think about the calculations you did in Part A. also it gave real life problems...er how to tackle real a problem. Yep.</p>		<p>No. I think they are fine.</p>
<p>Kenny</p>	<p>++</p>	<p>Um, if I couldn't do one I got worried cause I had no problems with them</p>	<p>Part B I didn't find it hard, I didn't know what the big problem was... 'cause people went on about having to go find out and writing a small essay, but I mean...</p>	<p>They helped me to keep me on my toes. it was like a ja, ja ok, and then ok why cant I do this? Someone help!</p>	<p>Make them harder..</p>
<p>Kathryn</p>	<p>++</p>	<p>I think they are quite helpful, 'cause in the beginning when you don't really understand the concepts. Well, when I am learning for a test and I look back at homework assignments I realize just how easy they were, then when I actually did them the first time. So they definitely help you grasp new concepts.</p>	<p>Part B, I think lots of people think it is really irritating, but I think it is a skill that you have to learn cause that's what life is going to be like once you become a chemical engineer. You know it is not only going to be about applying a formula, but you're going to have to explain what you did and why and be able to draw it.</p>		<p>I can't think of anything that needs to change...No I don't think they should be for marks. I think it is good that it counts towards your DP, otherwise people would never have bothered to do it. And it also make you do them, but generally when you are starting a new concept, you make many mistakes and I think you get to make your mistakes on homework assignment and by the time it comes to the test you know what's going on.</p>

Shane	+	Ja, they are helpful. I think they help to reinforce what you are doing during the lectures	I think Part B is very good. Last year we didn't have it, it was just the calculations. Part B asks you to explain what you have done in Part A and I think that's very important	But I also think also, like this year we did not get homework assignments for other sections like energy balance. I think we should get weekly problems for every section we do. That will help you.	I also think that we shouldn't get one problem, but multiple problems. So we should get variation of questions so that you know that for the exams you can study using your homework assignments.
Sipho	-/+	Ok, firstly at the beginning of the year they were just annoying to me. I just didn't understand why you needed to do that stuff. To begin with, the first homework assignment was just annoying because it was not testing any concept... But anyway, they got more course orientated, and then they tested some of the things and sometimes they got really challenging... They were helpful. At the end of the day, what I worked towards was doing them on my own because I found a great help in doing that because they test you. They really test you, if you master the homework assignments you can be sure that whatever comes in the test you can handle it.	I enjoyed Part B. but I must say it used to bore me. But when it came to phase diagrams, that's when I found this Part most useful for me. For the other concepts I felt like part B was just an extra work..	I think there is a lot of benefit in doing them. Well in a way you are still a first year, they don't make the transition between varsity and high school that drastic because in a way you know that you still have something to do and you are pushed to do it, you just find yourself doing your work in the process and I think that's important. I also think if you just have concepts being thrown at you, without much care if you understand them, well homework assignments care enough to check and reinforce those concepts. They steer you in the right direction.	
Ntsane		I don't think they made any difference. Because, sometimes like you never even had time to do it, so you do it on Tuesday then you just submit it. So when you write it you just write it to get rid of it because you know that it is a dp requirement ja. So ja. So just like that.			

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