Phenomenographic Studies in Variations of Learning and Teaching of Economic and Management Sciences in Secondary Schools

BY

Thomas Edwin Buabeng Assan

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Promoter: Prof. M Mwenesongole

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DECLARATION

I, Thomas Edwin Buabeng Assan, hereby declare that this dissertation for the degree of Doctor of Philosophy in Education at the North West University (Mafikeng Campus), is my original work and has not been submitted by me or any other person at this or any other university. I also declare that all reference materials contained in this study have been duly acknowledged.

Name : Thomas Edwin Buabeng Assan

Signature : .....

CERTIFICATE OF ACCEPTANCE

PHENOMENOGRAPHIC STUDIES IN VARIATION OF LEARNING AND TEACHING IN ECONOMIC AND MANAGEMENT SCIENCES AT SECONDARY SCHOOLS

BY

THOMAS EDWIN BUABENG ASSAN IN THE SCHOOL OF UNDERGRADUATE STUDIES FACULTY OF EDUCATION, NORTH WEST UNIVERSITY (MAFIKENG CAMPUS) IS HEREBY RECOMMENDED FOR ACCEPTANCE FOR ASSESSMENT.

PROMOTER : PROF. MW MWENESONGOLE

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DEDICATION

I dedicate this piece of work to my late father Augustine Yaw Assan who advised me when I was only nine years old, that "Kojo dzi buukuu no" meaning *study hard*. I want to tell him in spirit that "daddy mmaa dzi buukuu no"; that means *I have studied*.

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Knowing is not enough, we must apply.
Willing is not enough, we must do.
Goethe

ABSTRACT

The main purpose of this research was to establish how the theory of variation could be used as a resource to enhance learning in Economic and Management Sciences. In the process three specific interdependent research questions were addressed: firstly "how can we develop among learners a good understanding of a particular topic in EMS, for example how the price or value of the Rand is determined on the Foreign Exchange market? secondly "how can the theory of variation be used as a tool for learners to experience the object of learning in a particular way?"; and lastly, "How can the use of a learning study help educators to improve their teaching and make a particular kind of learning possible?"

The study utilised pre-test-post-test retention design experiment in phenomenographic studies. A learning study tool within the variation theory of learning was incorporated into a series of grade nine classroom-learning activities on foreign exchange market operation. 361 learners participated in the study.

Three main findings were established. Firstly an outcome space was found which contained four qualitatively different ways of experiencing the determination of the Rand price/value on the foreign exchange market. Secondly there was a statistically significant difference between the pre-test and post-test in learning outcome of the understanding of Rand price determination. This was demonstrated using t-test at ρ-value of 0.000, followed by Levene's t-test for equality of variance test. Thirdly, the results showed an educationally significant improvement in learners' understanding of the EMS concept, through the application of a learning study tool in the variation theory of learning

The study therefore supports the role of the theory of variation of learning, which means that learning to see something in a particular way is a function of experiencing simultaneous variation in critical aspects of the object of learning. Educators identify the critical

aspects related to different ways of understanding of a particular object of learning, and to design the patterns of variation, or create the space of variation *consciously* with respect to these critical aspects.

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ABBREVIATIONS USED IN THE TEXT

AC	Assessment Criteria
ANC	African National Congress
EMS	Economic and Management Sciences
NCS	National Curriculum Statement
RNCS	Revised National Curriculum Statement
FET	Further Education and Training
DOE	Department of Education
DNE	Department of National Education
DET	Department of Education and Training
HSRC	Human Sciences and Research Council of South Africa.
FOREX	Foreign exchange
GDP	Gross Domestic product
$	Symbol for the United States Dollar sign
£	Symbol for the British pound
€	Symbol for the Euro
NCS	National Curriculum Statement
TBVC	Transkei, Bophuthatswana, Venda and Ciskei

JMB	Joint Matriculation Board
IEB	Independent Examination Board
SARCERT	South African Certification Council
INSET	In-service Training
VAT	Value Added Tax
GST	General Sales Tax
GCET	General Certificate in Education and Training
SEASA	Science Education Association of South Africa
REQV	Required Education Qualification Value
BED	Bachelor of Education
HONS	Honours
SO	Specific Outcomes

CHAPTER 1

BACKGROUND AND ORIENTATION

1.1 Introduction

There is a widespread belief that one of the main functions of educational research is to improve educational practice (Hargreaves, 1997; Mortimore, 2000). Elliot (1990:16) echoed this position and wrote, "educational research is a form of practical inquiry which fuses inquiry with practice". A great deal of emphasis is given to the importance of maximising the impact of educational research on practice. Paradoxically, as Kaestle (1993:26-27), has pointed out, "the most common complaint levelled against research is the lack of connection between research and educators' practice". Research is rarely found to lead towards improvements in classroom practices. In the complex world of education, unlike that of defence or medical care, research is conceived of as not playing the major role that it should play in shaping practice (National Research Council, 1999).

Similar dilemmas can also be found in the field of research on learning. Some researchers argue that research on students' learning should take a more pragmatic approach and focus on helping educators to improve their classroom instruction, rather than developing a theory of cognition or learning (Cobb, 1995), whilst other researchers advocate more theoretically orientated educational research (diSessa, 1991). However, it is encouraging to note that more and more researchers regard

educational research and applications in education as synergistic enterprises and aim to promote an environment that allows research and practice to occur in unison (Glaser, Lieberman, and Anderson, 1997; Schoenfeld, 1999). As Schoenfeld (1999:14) puts it, "we can choose to explore theoretical issues in contexts that really matter, and when we work on important problems we can try to frame them so that our work helps us make progress on fundamental issues".

As an educator, the researcher has had the experience of meeting a variety of South African-based educators who had tried in their very best to bring about learning among the South African learners on whom this study was done, yet many have been unable to get their learners to learn. The researcher also had the opportunity to visit the classes of student educators both South African and Botswana schools. In some instances, the lessons went very well and learners demonstrated a very good understanding of the teaching content. During post-lesson conferences, both student and experienced of educators often confided in the researcher that the educational research, or the theories or principles that they learned from their teacher-training course were not relevant to their actual teaching. I have been pondering whether theory and practice really could inform each other in order to bring about learning in the classroom.

In the context of Outcomes-Based Education (OBE), the purpose of teaching EMS in schools is to enable learners to develop knowledge, skills, values and attitudes that will enable them to participate in, contribute to, adapt to, and survive in a complex economic society (Department of Education, 1997), in other words, to assist the learner to

develop an ability to experience a phenomenon from an economic perspective, Bowden, Dall'Alba, Martin, Masters, Laurillard, Marton, Ramsden, and Stephanou (1992) argue that detailed knowledge of the ways in which learners understand the central phenomena, concepts and principles within a domain prior to study is believed to be critical for developing their understanding of the central phenomena, concepts and principles, and hence for their mastery of the domain. For example, Thomas (1991:81) argues that the aim of EMS education is "to help students develop particular ways of seeing economic phenomena". To this end, educators need to work out "the important or critical differences between the ways in which those phenomena are seen or understood" (Thomas, 1991:82). They should also endeavour to bring learners' attention to bear on the critical aspects of the economic phenomenon in question, to help them look at not purely from a commonsense perspective, but to develop a more considered and sophisticated way of comprehending the phenomenon.

The economic concept chosen for the present study is "the foreign exchange market", with specific reference to the determination of the value or price of the South African currency, the Rand. The choice of this concept is justified on the grounds that it is a common economic phenomenon that affects the lives of every member of the community. For example, when the petrol price goes up and down everyone becomes concerned. Again when the local prices of goods and services go up, authorities attribute this to increases in input costs from imported goods and services. The value of the Rand has been largely attributed to growth or reduction in employment in South Africa. Key players in the economy

such as the manufacturing and the mining industries have often blamed the Rand for job cuts, and slow economic delivery and growth.

It is envisaged that if students could develop an economic perspective in understanding this topic, the different ways in which they were able to understand the economic phenomenon would increase. This topic is repeated across almost all levels of the school EMS curriculum. In addition, the concept has become very much over used in South Africa in relation to employment, wages and export competitiveness. Indeed, it is considered to be a topic that every citizen is entitled to know under the new democratic dispensation. In the preamble to the new school curriculum, it was mentioned that economic literacy has become necessary if the aspirations of a democratised society are to be achieved (Department of Education, 2002). In the last quarter of 2005 ending in December, the manufacturing sector's contribution to the Gross Domestic Product (GDP) was reported to have shrunk on the basis of the stronger Rand, and the speculation was that employment and economic growth would be affected if nothing were done to minimise the impact of the stronger Rand on the earnings of the export sectors of the economy (Langeni, 2006).

The objective for this study is to develop the ability of learners to take into account the notion that the concept of the foreign exchange market is linked with market factors. It is envisaged that if students could develop an economic perspective in understanding the foreign exchange market, the different ways in which they would be able to understand the economic phenomenon would increase.

It is widely believed that to improve learning in school settings, where much of what our society expects learners to learn is concentrated, the quality of teaching is the one ingredient that most likely makes a difference (Stigler and Hiebert, 1999). A good many studies which have been conducted on classroom practices (Brophy and Good, 1986; Hopkins, Ainscow and West, 1994; Hopkins, Ainscow, West, Harris and Beresford, 1997), concern the effectiveness of different pedagogical arrangements, for example, whether learners worked individually or in groups, whether they had access to computers or worked only with paper and pencil.

However, according to Pang (2002), there has been no definitive statement about which arrangement is most conducive to student learning, as identical pedagogical arrangements often result in different qualities of learning outcomes in different situations. This implies that the quality of teaching and learning might not be directly influenced by pedagogical arrangement per se.

In addition, no matter what pedagogical arrangement educators adopt, teaching and learning have an object – teaching cannot take place in a vacuum. It has been argued (Pong and Morris, 2001), that researchers often fail to investigate whether educators handle the object of learning, that which learners are supposed to learn, in ways that take into consideration the experiences of learners themselves. They contend that in order to see how learning can be brought about, one needs to examine closely how the object of learning is made available to pupils in the classroom. For that reason, this study has adopted as its research method the "learning study", whose primary focus is on the object of learning.

The theory of variation (Marton and Booth, 1997; Bowden and Marton, 1998; Marton and Pang, 1999, Marton and Pong, 2005), from the field of phenomenography, was chosen as the basis for this learning study, and this theory is elaborated upon in chapter 2.

According to Marton (1981), phenomenography is a research specialisation that stresses the importance of studying how people experience the world around them in qualitatively different ways. The theory of variation provides an explanatory framework and theoretical position to account for a certain way of experiencing a phenomenon and how to develop it. Phenomenography was chosen because it focuses on the object of learning and has a practical orientation.

Specifically, the theory of variation was used because it arose from the field of education and it has a strong classroom application in promoting different ways in which people experience or understand certain phenomenon. The ultimate aim of the theory of variation is to improve classroom teaching and in turn to make learning possible.

This is an example of a "learning study" in three senses (Pang, 2002:5). In the first place, the learners participating in the study are expected to learn about the object of learning and to learn better than they otherwise would have done. Secondly, the educators participating in the study are expected to learn about handling the object of learning, not only the specific object, but the object of learning in general. Lastly, the researcher participating in the study is expected to learn about how the theory works within the OBE approach in the secondary schools, because every learning study is based

on a particular theory and in this study the theory of variation is put to a test.

1.2 The Statement of the Problem

The main purpose for this study was to identify ways of systematically strengthening classroom practices in order to make learning possible, through the theory of variation of learning in phenomenographic studies.

Educational, institutional, clinical and organisational development work has fostered a growing interest for what makes qualitative changes possible in work-related situations. Whether such changes occur appears partly due to the extent a person is able to change his/her way of seeing/experiencing/understanding something (Marton and Booth, 1997). Educators of today aim to meet future needs of development of competence linked to individuals' ways of experiencing the world around them (Velde, Ghaye, and Wood, 2001). Such knowledge formation needs to build on research into how the processes of changing ways of understanding something are experienced.

This study uses a particular theory, looks at a particular practice, and focuses on a particular object of learning in the field of Economics and Management Sciences (EMS) learning area. This particular object of learning relates to how the foreign exchange market works within the free market system. In this case learners' understanding of how the value or price of the South African Rand is determined was explored before and after the learning study tool had been incorporated into classroom activities in certain identified schools.

As an EMS educator and a teacher educator for over 25 years, of which 19 years have been spent on learner and teacher support and development in South African Schools, Colleges of Education and the University, the researcher chose Economic and Management Sciences Education as the subject context of this study, since the researcher is quite familiar with the curriculum and the educators. Besides, the concept chosen for this study, that is 'foreign exchange market' constitutes part of the broader EMS learning area. With respect to the title and the foregone statement of the problem, the study attempted to seek solutions to the following key research question.

1.3 Key Research Question addressed in this study

The key research question this study addressed was "how can educators make use of the theory of variation as a resource for making a particular kind of learning possible in Economics and Management Sciences' classroom?" The specific research questions were as follow:

1. Can we develop, among learners, an improved understanding of a particular topic *foreign exchange market* in EMS?

2. Does the use of learning study as a tool within the theory of variation allow learners to experience the object of learning *foreign exchange market* in a particular way?

3. Can the use of a learning study help educators to improve their teaching and make a particular kind of learning possible?

(*italics* are researcher's emphasis)

1.4 Objectives of the Study

The present study therefore had three major objectives, based on the topic, statement of the problem and the key research questions, which correspond to the three senses of learning in a learning study mentioned above. The three objectives were:

- to find a learning and teaching strategy or tool within the variation theory of learning for educators to help grade nine learners handle a rather difficult but important Economic and Management Sciences' concept;

- to evaluate the effectiveness of a learning study within the variation theory of learning, as a strategy to improve learning and teaching.

- to establish the efficacy of the variation theory of learning for OBE.

1.5 Original Contribution to Knowledge

To the best of the knowledge of the researcher, no similar kind of study has been conducted in South Africa. The study therefore represents a substantial and original contribution to knowledge in that an in-depth perspective was taken with respect to the investigation into variations in learning and teaching among grade nine economic and management learners.

The study extends and integrates theory and findings from several areas of research relating to variations of learning and teaching. The variation theory of learning was tested against grade nine experiences in studying foreign exchange market. Pang (2002:244), agrees that the application of the theory of learning, a learning theory in practice, helps to extend the theory of variation to a "pedagogy of variation".

An important significance of this study was to put the variation theory of learning into practice and thereby inform and support educators in designing learning environments, which would enhance the OBE approach and promote effective learning and teaching of Economic and Management Sciences' (EMS) concepts.

1.6 Definition of terms

The following concepts or phrases are defined and/or interpreted here to reflect their meaning as used in this study.

1.6.1 Phenomenography

This is social research approach derived from phenomenology which focuses on how life is experienced. As a research specialisation, phenomenography aims at describing variations in human meaning, understanding and conceptions of peoples' life world. In this study, phenomenography, (Marton, 1981; Pang, 2002; Marton and Pong, 2005) denotes the awareness or ways of experiencing or understanding a particular phenomenon, the *foreign exchange market.*

1.6.2 Phenomenographic Studies

This involves an approach to research the outcome of which is a description of the qualitative variation in the ways a group of people experience a phenomenon (Trigwell, 2000). The perspective is more on how the learner experiences something in a qualitatively different way. The educator's role is to engage in teaching that explores variations in ways of understanding. In phenomenographic studies, good teaching is where learning outcomes are seen in terms of qualitative difference because such ways of understanding encourage deep approaches to learning (Trigwell, 2000). This study adopted the phenomenographic studies perspective and therefore did not focus successful learning on the production of more knowledge nor on attainment of 50% or more in the learning outcomes but on how the learners experienced a particular concept differently as specified.

1.6.3 Conception(s)

A conception is a unit of description in phenomenography (Marton and Pong, 2005) and refers to different ways of experiencing or understanding a particular phenomenon. A conception is made up of two aspects (Pang, 2002; Marton and Pong, 2005): the *referential* aspect, which refers to the global generally accepted meaning of the object or phenomenon conceptualised; and the *structural* aspect, which shows the specific combination of features that have been discerned and focused upon (understood) by the learners. A feature of an object or phenomenon according to Marton and Pang (2005:335) is "a way in which the object appears to be different from other objects" and the discernment of a

feature is a function of the variation experienced by the learner. In this study the focus was on the description of conceptions one particular phenomenon, namely how the Rand value or price is determined on the foreign exchange market. The object of analysis in this study was to evaluate the individual learning results based on the different conceptions from the pre-test to the post-test on Rand price/value determination.

1.6.4 Outcome Space

This is a representation in the form of categories of descriptions or ways of experiencing the phenomenon, (conceptions) which are further analysed with regard to their adequacy and logical relations (Marton and Pang, 2005). According to Åkerlind (2005) outcomes are represented analytically as a number of qualitatively different meanings or ways of experiencing the phenomenon, but also including the structural relationships linking these different ways of experiencing. In other words, outcome space represents predetermined levels on which the different conceptions are placed for the purpose of ascertaining their hierarchical positions with reference to the referral and structural aspects of the conceptions and also to "distinguish the empirically interpreted category from the hypothetical description that it represents" (Åkerlind, 2005:322). In this study an outcome space was constructed (Diagram 3) on which the various conceptions for both pre-test and post-test results were locally categorised and analysed based on their hierarchical structural relationships.

1.6.5 Variation Theory of Learning

In phenomenographic perspective, learning occurs when the learner is able to identify the critical aspects of the objects and situations, and focus on them simultaneously (Wood, 2006). The variation theory of learning is a theoretical approach that can be used to describe what is required for learning to occur. According to Linder and Marshall (2003) learning cannot take place without discernment, and discernment cannot take place without variation. Using variation theory means 'trying alternative ways of understanding' (Marton, Asplund-Carlsson and Halász 1992:10) a phenomenon, either in part or whole, and making explicit the implications of their way of understanding the whole phenomenon or parts. In this study, a group of educators utilised the variation theory of learning to enhance learners' understanding of the foreign exchange market through the learning study tool.

1.6.6 Learning Study

A learning study is a tool within the variation theory of learning whereby learner support is built on innovative learning environments coupled with educators' subject knowledge, experience and dedication through classroom lessons, with the primary focus on an object of learning and not on teaching methods (Pang 2002 and Marton and Pang 2003). Chapter 3 gives details on how learning study was used to enhance learning in this study.

1.6.7 Object of learning

An object of learning is what the learner discerns from the critical aspects of the phenomenon, as a result of engaging in a learning process. A critical aspect of the object of learning is necessary for a particular meaning to appear in the learner's awareness (Wood, 2006). The presence or absence of any critical aspect distinguishes between the meanings of the object of learning from one another (ibid). According to Wood (2006), an object of learning could be constituted in three different ways within the theory of variation of learning. The *intended* object of learning *(*intended learning outcome) was what educators planned for. The *enacted* object of learning was what learners encountered in the classroom. This was constituted together by both learner and educator and what was learnt depended upon the dimensions of variation "corresponding to critical aspects of the object of learning" (Wood, 2006:55). Thirdly was the *lived* object of learning which referred to what was actually learnt, which depended upon what dimensions of variation of learning were actually experienced by the learners as explained in chapter 4. In this study therefore, the determination of the price or value of the Rand within the foreign exchange market formed the object of learning within the theory of variation of learning.

1.6.8 Secondary schools

Secondary schools in the South African education context and as used in this study refer to the Senior Phase Band, which extends from grades 7 to 9.

1.6.9 Learner

A learner as used in this study refers to grade nine pupils who attend and receive formal school lessons from an educator in the NorthWest Province of South Africa. A grade nine learner (DoE, 1997) belongs to the Senior Phase of the General Education and Training Certificate (GETC) and these learners are described by the policy document as having the ability to engage in open argument and "are willing to accept multiple solutions to single problems, less contextualised, more abstract and more area specific" (DoE, 1997:6). Hence the object of learning used in this study is appropriate for the participants.

1.6.10 Educator

As used in this study an educator is any professionally qualified person who teaches, educates or trains other persons, or provides professional educational services and who is appointed in a post on any educator establishment under the Employment of Educators Act, 1998, (No. 76 of 1998). As educators, we know that successful learning is underpinned by 'tapping-into' learners own interests and by motivating learners through interesting challenging and relevant activities (variation of learning). In this study the educator represents qualified and experienced EMS classroom teacher.

1.6.11 Learning and Teaching

In this study the current common language of 'learning and teaching' instead of 'teaching and learning' is used. According to Jephcote and Abbot

(2005) learning and teaching in EMS education involve integrated classroom activities, whereby the ownership of the task, how the classroom is organised to promote learning, and, ultimately, the extent to which learners will engage in what they think is abstract or irrelevant are the responsibility of both the learners and the educator. Effective learning and teaching in EMS classroom is not to ignore the ways in which learners make sense of the world around them and the ways in which they bring to and use their everyday knowledge in the classroom. Learning and teaching therefore constitute the object of learning which is "to get learners to reflect on the differences between what they know and believe and what the teacher or other learners know and believe. In this way they are led to believe that their own 'knowledge' is necessarily right but are encouraged to reassess its basis" (Jephcote and Abbott, 2005:64). In this study therefore, learning and teaching constitute all the classroom activities, which result in discernment of the critical aspects of the object of learning or the desired outcome.

1.6.12 Economic and Management Sciences (EMS)

In terms of the policy document (DoE, 1997) EMS is an independent learning area for grades 7 to 9. In the National Curriculum Statement (NCS) and also as referred to in this study, Economic and Management Sciences (EMS) "involves the study of the use of different types of resources efficiently and effectively in satisfying people's basic needs and wants, while reflecting critically on the impact of resources exploitation on the environment and people" (DNE, 2002:12). The topic chosen for this study appears in the EMS specific outcomes 4, 5, 6 and 7 and also appears in different forms under other learning areas such as human and social

sciences and technology. Under the NCS the topic appears under level outcomes 1, 2 and 4. Internationally, this field of subjects' discipline is referred to as Economics and Management Sciences (EMS) but in the South African educational context where this study was based, the term Economic and Management Sciences (EMS) is widely used. Both terminologies are used interchangeably in this study to refer to the same field of subjects' discipline.

1.6.13 Exchange Rate

Exchange rate is the *price* of one currency in terms of another (A concise Dictionary of Business, 2002). It is usually expressed in terms of how many units of the home country's currency; in this case the South African Rand, are needed to buy one unit of the foreign currency, for example the United States Dollar. According to the South African Reserve Bank, (2004:8) the exchange rate of the Rand is basically determined by supply and demand in the market for foreign currency.

1.6.14Rand Price/Value

Price is that which must be given up in order to acquire a good or service and value is however the worth attached by someone to something (A concise Dictionary of Business, 2002), for example, the worth attached to the South African Rand in terms of other currencies. In this study, the value of the Rand is treated as an objective reality determined by market forces. Hence price and value of the Rand used refer to the exchange rate of the Rand and are used interchangeably or simultaneously in this study.

1.6.15 Foreign exchange market

Foreign exchange market is the system through which the exchange rate of currencies is determined. It constitutes the foreign exchange market. Through the foreign exchange market the value of currencies are determined and maintained. The mechanism helps exchange rate stability and co-ordination. In this study, the foreign exchange market facilitates the determination of the Rand price/value.

1.7 The Study Design

A learning study (as utilised by Pang, 2002, in his study on sales tax) was employed to allow a group of educators to make use of a learning theory (the theory of variation) to develop learners' understanding of a particular topic in EMS (the Rand price determination on the foreign exchange market). As discussed later in chapter 3, a case study with a pre-test-post-test-retention design was conducted with grade nine learners from four schools. A total of about 200 learners took part in the pre-test. The pre-test was intended to form the basis to launch the lessons and also to provide comparison of learning outcome before and after the application of the learning study. At the pre-test, the participating learners' understanding of the topic was probed by asking them to complete a written task, and a sub-sample of learners was interviewed in order to investigate the qualitatively different ways that they experienced the phenomenon of foreign exchange market. As explained in chapter 3, on the participants' selection, the focus of the research was on developing a powerful learning strategy using a particular theory, hence and in line with

the trend for these kinds of study, the number of participants was deemed appropriate.

The learner data obtained were coded and analysed to derive the categories of description and thus the outcome space (discussed in chapter 4), which helped the educators in the main study to identify the critical features of the object of learning when they planned their lessons.

In the main study, four EMS educators from the same schools where the pre-test was conducted were involved. Drawing on their own experiences and intuition together with the results from the pre-test showing the qualitatively different ways in which learners understood *foreign exchange market*, the educators worked together to develop a joint plan for a series of lessons, which were then implemented in the respective grade nine classes (Pang and Marton, 2003). Lessons were observed and subsequently analysed in terms of the enacted objects of learning. After a series of lessons the learners' understanding of *foreign exchange market with specific reference to the Rand Price/value determination*, the particular object of learning, was evaluated.

Whilst participating in the discussions, I introduced the variation theory of learning as a tool for developing powerful lesson plans. Both the lesson plans that emerged and the enacted objects of learning demonstrated the educators' understanding of the theory of variation as applied to the particular object of learning.

The process of conducting the study is depicted in the diagram 1 overleaf.

Diagram 1: An outline of the Research Design

Pre-test		**Main study**		
Learners' qualitatively different ways of experiencing the phenomenon of "foreign exchange" explored through Pre-test (Written tasks plus sub-sampled interview)	C o m p a r i s o n	Learning Study within the Theory of Variation (Theory Inspired)	Lesson Planning & Classroom Teaching incorporating Learning Study Tools	Evaluation of Student Learning (Post-test) in form of written tasks and interviews of sub-sample

1.8 Structure and Style of the Thesis

The primary focus of the thesis was on the object of learning as a point of departure. It is worth noting that the study did not concern teaching and learning as such, but its focus was on the classroom interaction that was supposed to generate learning. It is therefore essential to understand the view of learning adopted for the study. Consequently, chapter two examined the three dominant perspectives of learning in the field of educational psychology namely, learning as "constructive learning", "participatory or social learning" and "phenomenographic learning", together with their implications for instructional design..

In the same chapter two, the paradigm of learning on which this present study was based and which Pang (2002); Marton and Pong (2005) describe as "learning as seeing" which has been chosen as a very relevant one for phenomenography, was presented and the development of the research specialization that informs this study was also examined.

This review consisted of five different development phases: the study of learners' differences in learning; the study of the variation in the ways people experience phenomena; characterising a way of experiencing according to the theory of variation; employing the analytical framework derived from the theory of variation to describe and analyse classroom teaching; and finally, employing the theory of variation in designing instruction to make learning possible in the classroom. A discussion of phenomenographic research studies in EMS education was specifically provided in chapter two. The South African perspective on teaching and learning was critically examined in this chapter too. This chapter therefore served as the literature review for the study.

Chapter three examined the study design and methodology, which had been adopted in terms of the basic design of study, data collection, and data analysis. In general a qualitative case study approach was adopted for the research and this was included within the phenomenographic research approach. The study period stretched from May to September 2005 during the school sessions. Specifically, there was a focus on the nature of a learning study upon which this research was built.

Chapter four provided an analysis of classroom learning and teaching using the framework based on the variation theory of learning. The intended objects of learning as well as the enacted objects of learning (Pang and Marton, 2003; Marton and Pong, 2005; Wood, 2006) were examined on pre-determined outcome space (Dahlgren, 1997; Thomas and Wood, 1997) and comparisons were drawn between the pre-test and post-test results as

well as between schools on the learning outcome concerning Rand price/value determination on the foreign exchange market.

The results of learning which are expressed in terms of learners' conceptions and categorised in accordance with the outcomes identified for the object of learning, were also presented in this chapter in the form of both qualitative and quantitative analysis. An inter-schools comparison was conducted where necessary. Chapter five provided space for conclusions and recommendations derived from this research.

Lastly, the style of the thesis is based on both first person accounts and passive voice reporting. Where it is important for the reader to know how aware the researcher was about certain critical matters in the study, the first-person account in which incidents of the fieldwork are discussed was used to demonstrate methodological assessment of the quality, and expose how the researcher has handled the issue sufficiently critically relating to what happened in the field (Yates, 2004).

Reporting in a passive voice was necessary to ensure that the work reported could be replicated by someone else; in this case " the thesis is seen as a work of reporting, what was done, including the findings and offering some objective theoretical interpretations to those findings and the particularities of the researcher are not present in the text" (Yates, 2004:78).

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the literature review within which this study is grounded. It is divided into four sections basically to explore in detail the perspectives on knowing, phenomenography and phenomenographic studies. The chapter also examines the status of EMS education in South Africa.

2.2 Perspectives on Knowing

A learning theory provides the ground motive for any instructional design. Many educational theorists believe that by finding out how people learn, they can establish a body of knowledge from which implications about the design of instructions can be drawn. As mentioned in the last chapter, this study aims at exploring how one particular theory of learning and instructional practice can inform each other in normal classroom settings, and in order to do this, it is crucial to examine the perspectives of learning which form the basis of various instructional designs and classroom practices.

This section introduces the major views of learning in the field of education, including a discussion of the theoretical positions of the present study. However, given the volume of research into learning, a meaningful discussion would be impossible without focussing on some on-going debates and prominent issues. Three influential views of learning are

examined, namely: the constructivist paradigm, the participating (sometimes called, situated or social learning paradigm) and the phenomenographic perspective, all of which have great impact on instructional design.

A paradigm is a way of looking at the world and is composed of certain philosophical assumptions that guide and direct thinking and action (Mertens, 1998). According to Pepper (in Pang, 2002), there are basic perspectives underlining any epistemology, which remain tacit and implicit, but which underpin the shared understanding of a research paradigm. These perspectives point to the process of learning and discovery and help to constitute, not merely reflect, scientific theory and practice (ibid). The researcher uses the above line of reasoning to present these perspectives in order to discuss the development of these perspectives on learning.

The implications of each of these perspectives for teaching are discussed in a succinct manner with the use of an example for each. Major commonalities and differences are highlighted amongst these perspectives and the main reason for adopting phenomenography rather than any of these perspectives in the present study is provided. According to Runesson (1999), there are three perspectives on learning, which dominated classroom research, namely; cognitive science, socio-cultural and constructive perspective. This chapter focuses on further discussion on the perspectives, which serve as the theoretical basis for this study. The particular perspective taken decides which aspect of the very complex process is the object of the study. The studies from these different theoretical perspectives can be seen as complementary, since they are likely to give different contributions to knowledge of learning and teaching.

But then, to what extent can each of these perspectives grounded in phenomenographic research of learning, contribute to shed light on possibilities for learners to learn EMS?

2.2.1 Knowing Involves Learning

Sfard (1998) describes contemporary perspectives on learning in terms of two metaphors, the acquisition metaphor and the participation metaphor. Emanuelsson (2001) added the third dimension of learning, which she calls the "constitutive" (the theory of variation/phenomenography). Lave (1996) is of the opinion that all learning theories at a minimum should address three aspects of learning, tells –

- the direction of learning,
- mechanism and
- subject-world relation.

The metaphors on learning are presented in Table 1 below:

Table 1: Metaphors on Learning

	Acquisition (Constructivism)	**Participation** (Social-cultural perspectives)	**Constitution** (Theory of variation/ Phenomenography)
Subject-world relation	Varying, unclear	Varying, unclear	Non-dualist explicitly
Tells, the directions of learning	Internal consistency, resolution of contradictions, viability	Peripheral to central participation, use of artefacts and discourse	Increased differentiation of wholes, inclusivity
Mechanism	Cognitive conflict adaptation assimilation accommodation reflective abstraction	Participation, pre-interpretation mediation	Variation, discernment, simultaneity
Agent who or what, drives learning	The individual, the inner strives for equilibrium, the outer constraints	The collective, discourse, culture, the "outer" precedes the "inner"	Relations to other and to the world, interplay between "inner" and "outer"

Source: Emanuelsşon (2001:228)

According to Emanuelsson (2001), the proposed third metaphor that is the phenomenography tries to transcend the theoretical gap between the other two. The theoretical framework of this study can therefore be related to the tradition of learning as a social and cultural practice (Vygotsky, 1978; Bruner, 1990; Wenger, 1998; Säljo, 2000) and to the tradition emphasising the individual learner trying to make sense of the world (Ausubel, 1968; Furth, 1979; Piaget, 1971; von Glasersfeld, 1996). Phenomenography however can also be related to Gestalt psychology (Wertheimer, Gurwitch, in Emanuelsson, 2001) but involves a more precise focus upon how the

learner sees, experiences or understands what is learnt (Marton and Booth, 1997; Bowden and Marton 1998).

2.2.2 Learning as Acquisition (Constructing)

Constructivism does not claim to have made earth-shaking inventions in the area of education; it merely claims to provide a solid conceptual basis for some of the things that until now, inspired teachers, used without theoretical foundation (von Glasersfeld, (1995). In the constructivist theory, the emphasis is placed on the learner rather than the teacher. It is the learner who interacts with objects and events and thereby gains an understanding of the features held by such objects or events. The key notion in constructive theory is that people learn best by actively constructing their own understanding. The learner, therefore, constructs his/her own conceptualisations and solutions to problems. Learner autonomy and initiative is accepted and encouraged.

This form of learning metaphor emerged in the late 1970s. Since the late 1980s, however, researchers have been building an understanding of learning that grows out of cognitive and developmental psychology (Cobb, 1994; Davis, Maher and Noddings, 1990; Roth, 1993; Ernest, 1995; Fosnot, 1996; Marshall, 1996; Spivey, 1997). In the constructivist classroom, the learner is presented with opportunities to build on prior knowledge and understanding to construct new knowledge and understanding from authentic experience. Learners are allowed to confront problems which are full of meaning because of their real-life context. In solving these problems, learners are encouraged to explore possibilities, invent alternative solutions, collaborate with other learners (or external

experts), try out ideas and hypotheses, revise their thinking, and finally present the best solution they can derive.

In contrast to the typical behaviourist classroom, where learners are passively involved in receiving all necessary critical information from the educator and the textbook, in the constructivist paradigm, understanding is seen as being composed of *building blocks* of understanding, which are outcomes of preceding acts of construction. Unlike the behaviourist classroom, where learners are taught how to *get the right answer* using the educator's method, in constructivist view of learning, knowledge structures, which have actually been constructed in the mind, will then form the basis for subsequent constructions through restructuring. Central to constructivism is its conception of learning. Von Glasersfeld argues that: "From the constructivist perspective, learning is not a stimulus-response phenomenon. It requires self-regulation and the building of conceptual structures through reflection and abstraction" (1995:14).

Fosnot (1996:10) adds that "Rather than behaviours or skills as the goal of instruction, concept development and deep understanding are the foci... for educators". The challenge is to be able to build hypothetical model of the conceptual worlds of learners since these worlds could be very different from what is intended by the educator (von Glasersfeld, 1996). According to Ernest (1995:461), "the constructivist metaphor describes understanding as the building of mental structures, and the term restructuring, often used as a synonym for accommodation or conceptual change, contains this metaphor".

Constructivism is often articulated in stark contrast to the behaviourist model of learning. Behavioural psychology is interested in the study of changes in manifest behaviour as opposed to changes in mental states. Learning is conceived as a process of changing or conditioning observable behaviour as a result of the selective reinforcement of an individual's response to events (stimuli) that occur in the environment. The mind is seen as an empty vessel, a *tabula rasa* to be filled, or as a mirror reflecting reality (Derry, 1996). Behaviourism centres on learners' efforts to accumulate knowledge of the natural world and on teachers' efforts to transmit it. It therefore relies on a transmission- instructionist approach that is largely passive, teacher-directed and controlled.

According to Jonassen (1991) *behaviourism* may be used in some contexts synonymously with *objectivism* because of its reliance on an objectivist approach to learning. Jonassen describes the assumptions of an objectivist approach to learning:

> ...objectivists believe in the existence of reliable knowledge about the world. As learners, the goal is to gain this knowledge; as educators, to transmit it. Objectivism further assumes that learners gain the same understanding from what is transmitted ... Learning therefore consists of assimilating that objective reality. The role of education is to help learners learn about the real world. The goal of designers or educators is to interpret events for them. Learners are told about the world and are expected to replicate its content and structure in their thinking (1991:28).

This objectivist model has resulted in somewhat of a stereotyped portrayal of teaching and learning, which is widely criticised and often evoked as the

target of educational reform. For example, the introduction of Outcomes-Based Education in South Africa was largely driven by the rejection of apartheid-based education, which emphasised mainly teacher-centredness, often referred to as fundamental pedagogy or transmission of knowledge, as opposed to a system whereby the educator becomes a facilitator of learning.

The constructivists have no doubt about the role of the educator and the learner. In von Glasersfeld's (1995b) radical constructivist conception of learning, the educators play the role of a "midwife in the birth of understanding" as opposed to being "mechanics of knowledge transfer". Their role is not to dispense knowledge but to provide learners with opportunities and incentives to build it up (von Glasersfeld, 1996). Mayer (1996) describes educators as "guides", and learners as "sense makers". In Gergen's (1995) view, educators are coordinators, facilitators, resource advisors, tutors or coaches. Understanding the role of the teacher in the constructivist classroom provides a useful vantage point from which to grasp how the theory impacts on practice:

> ...the role of the authority figure has two important components. The first is to introduce new ideas or cultural tools where necessary and to provide the support and guidance for learners to make sense of these for themselves. The other is to listen and diagnose the ways in which instructional activities are being interpreted to inform further action. Teaching from this perspective is also a learning process for the teacher (Driver, Aasoko, Leach, Mortimer and Scott, 1994:11).

The constructivist paradigm also affords a dualistic stance, in the sense that the learner and the world are regarded as separate entities. People do

get information from the world, but this information is only sensory – in itself it does not carry meaning, it is the mind, which combines these sensory impressions in order to construct meaning. Moreover, although people live in the same world, they construct meaning differently. This difference is not a function of what is out there, but rather of what is inside our heads. According to constructivist thinking, it is because we ourselves construct different images of the world in which we live.

In order to see how useful the metaphor of construction may be to pedagogy we have to ask what the driving force of knowledge construction is, and what brings about conceptual changes. In fact, according to this metaphor, the basic mechanism is conflict within the individual not between individuals, caused by the clash between existing knowledge or belief and the new knowledge, which is contrary to it. The concept of cognitive conflict usually arises from Piaget's idea of restoring mental equilibrium, or resolving conflict, through the interplay of assimilation and accommodation (Lawson, 1994; Rowell and Dawson, 1985) or the Festinger (1962) theory of cognitive dissonance (Driver and Erickson, 1983), and it is regarded as a significant tool with which to enhance learners' conceptual changes (Scott, Asoko and Driver, 1992).

There are various approaches to conflict-based teaching. Nussbaum and Novick (1982), for example, drawing upon the Piagetian notion of accommodation, suggested a teaching sequence aimed at inducing conceptual changes, in which learners were asked to interpret a specific problem concerning a phenomenon with their own preconceptions. The learners' awareness of their own interpretative frameworks and those of other learners were sharpened during the process. This was followed by

the introduction of discrepant events to create conflicts between the learners' existing conceptions and the phenomena in question. Finally, the educator guided them in their cognitive accommodation by presenting the experts' conceptualisation with an emphasis on the resolution of conflicts. The introduction of conflict at the start of the teaching sequence was attuned to the need for:

> ...recognition by the learner of a problem and his inability to solve it with his existing conceptions and assume that people have an innate need to reduce dissonance, incongruity and conflict between two cognitions (Nussbaum and Novick, 1982:186).

Many conceptual-conflict teaching strategies have been proposed (Osbone and Freyberg, 1985), and most are in line with the proposition of West and Pines (1985) that three phrases are generally involved: awareness, disequilibrium and reformulation. Most of the strategies, such as the "Generative Learning Model of Teaching" by Cosgrove and Osborne (1985:101) and the "Ideational Confrontation Model" by Champagne, Gunstone, and Klopfer (1985:163), require learners to resolve conflicts between views from different sources. The origins of conflicts include those between educators' notions and learners' notions, between the ideas contributed by different learners and between learners' prediction of the experiment results and what the textbooks suggest. However, Fensham and Kass (1988) cautioned that what appears to be discrepant to the educator may not be so to the learner. Confrey (1990:109) further argued that:

> ...when one applies constructivism to the issue of teaching one must reject the assumption that one simply passes on information to a set of learners and expects that understanding will result...When teaching concepts... she/he must assist the student in restructuring those views to be more adequate from the learners' and from the teachers' perspective.

Whether cognitive strategies can bring about learning depends upon whether learners are aware of the conflict, that is, whether the views perceived by learners are clearly conflicting. Also, for conceptual change to take place, learners must be dissatisfied with their current conceptions and at the same time the new conception must be intelligible, plausible, and fruitful (Posner, Strike, Hewson and Gertzog, 1982). In the process of conceptual change, it is imperative to identify learners' preconceptions. Through confronting learners' with anomalous information, conceptual conflict can be induced, and learners are guided into analysing their own conceptions, reconsidering their original propositions and consequently replacing their existing conceptions with more appropriate versions (Strike and Posner, 1985).

However, Chinn and Brewer (1993) found that learners might simply ignore, reject, exclude, hold in abeyance, or interpret the anomalous data provided, and thereby conceptual change would not be triggered. Furthermore, the earlier version of the conceptual change model (Posner, Strike, Hewson & Gertzog, 1982) was criticized for neglecting the affective and social aspects of conceptual change (Pintrich, Marx and Boyle, 1993; Strike and Posner, 1992).

It is somewhat difficult to draw a clear-cut conclusion regarding the relative merit of the conceptual change approach. In the field, there was

scepticism about its effectiveness in achieving its aims (Solomon, 1994), whereas based on an analysis of 103 conceptual change studies, Wandersee, Mintzes and Novak (1994:192) found that: "even with aforementioned caveats in mind, we remain impressed by the relative success some researchers have achieved today".

Guzetti, Snyder, Glass and Gamas (1993:149) conducted a meta-analysis of 70 studies of intervention strategies in science education and reading which has adopted quantitative measures in comparing treatment and control groups, and concluded that:

> ...based on the accumulated evidence from two disciplines, we have found that instructional interventions designed to offend the intuitive conception were effective in promoting conceptual change. The format of the strategy (e.g. refutational text, bridging analogies, and augmented activation activities) seems irrelevant, providing the nature of the strategy includes cognitive conflict (Guzetti et al 1993:149).

Much research effort has gone into bringing about conceptual change in classrooms, such as that by Champagne, Gunstone, and Klopfer (1985), Clement (1982), Driver (1987), Driver, Guesne, and Tiberghien (1985), Novak and Gowin (1984), Nussbaum and Novik (1982), Rowell and Dawson (1985), and Stavy and Berkovitz (1980). However, one of the studies, which have had the most far-reaching impact, is the Children's Learning in Science (CLIS) project at the University of Leeds (Brooks, 1987; Driver and Oldham, 1986; Scott, 1987) and this is used as an exemplar to illustrate how the metaphor of *learning as construction* has been put into classroom practice.

2.2.2.1 Application of the constructivism perspective to classroom instruction.

In the UK a research group working in the CLIS project set out to introduce a new theoretical perspective in devising teaching approaches which take into account learners' existing ways of thinking, and which promote changes in their conceptual understanding. The research group worked alongside three groups of about 15 science educators. The project's central aim was to devise, implement and evaluate teaching materials and strategies which attempt to promote conceptual change in selected science topic (Driver, 1981, 1989; Driver and Oldham, 1986).

The project was based on the paradigm of constructivist learning, which believes that individuals construct their personal knowledge through social interaction and experience of the physical contexts. The meaning that learners construct in a given situation is influenced by existing conceptions, and what is learnt or constructed depends on the interaction between the learner's present conceptions and the learning experiences provided.

According to Driver and Oldham (1986 109-110), scientific knowledge is also a human construction in which:

> ...science as public knowledge is not so much a discovery as a carefully checked construction. It follows that science in secondary schools involves not just knowledge about events and phenomena in the real world, but an appreciation of theories as imaginative human constructions.

The project assumed more or less the constructivist approach of teaching, which is characterised as: (1) identifying the target concept(s) to be taught

(the scientific way of knowing); (2) considering the nature of learners' existing thought; (3) analysing the difference between the scientific way of knowing and learners' existing thinking, which was considered by Leach and Scott (1995) as the learning demand of coming to understanding a particular concept; and (4) developing teaching approaches and activities to help learners address the learning demands and develop the scientific way of knowing. The teaching approach is guided flexibly by sequences typifying constructivist teaching, which include orientation, elicitation of learner idea, restructuring of learner ideas, application of new ideas and a review of learning that comprises the comparison of new ideas with prior ideas (Driver and Oldham, 1986). The underlying principle is to let learners reflect upon and talk about their own understanding.

To illustrate the ways in which educators help learners to construct meaning in the social context of the classroom, an episode is drawn from a lesson in the area of air pressure (Driver, Squires, Rushmore, and Wood-Robinson, 1994). The educator first explains a range of simple phenomena, which involve the notion of differences in air pressure inside and outside the object, and the class is asked to apply this notion to explain other phenomena in groups.

The educator helps the learners Christa and Adele to construct conflict of common sense and scientific views (Driver *et al*, 1994):

Christa: it's flat surface and there's no air in the cup, so there's less air in than there is in the outside, so it'll stick down.
Educator: So what does this pushing... this sticking it down?
Christa: Air

Adele: Sucking.

Educator: What's sucking?

Adele: It's something that pulls... it's something that pulls it down...

Educator: A minute or two ago, you said it was something to do with pushing the air out here.

Adele: Yeah.

Educator: and then you also said it was something to do with suction. Are these the same explanations, or are they different?

Adele: They're nearly... (Adele is not sure and comes to a halt.)

The educator reminds them of the earlier demonstration of the collapsing plastic bottle, in which he explained this process in terms of the difference in air pressure inside and out. The learners then came back to consider the application of the principle to this case.

Educator: Now, where's the inside and the outside of this?

Adele: Well... that's the inside (indicates the underside of the suction cup).

Educator: Yes... right.

Adele: Yeah, and that's the outside.

Educator: Uh huh – can you use the explanation like the one used for the bottle to explain what happens here? (The educator refers once again back to the collapsing plastic bottle.).

Adele: Has it got anything to do with gravity?

Educator: What makes you say that?

Adele: Pulling it down.

After some exchanges, both the educator and the learners reach a consensus that gravity might be acting on the suction cup even when there

is no air. Then they come back to the notion of the difference in air pressure:

Adele: It's sticking to the bottom of there – it [air] all comes out of the sides.
Educator: All right, and what about the air on the outside?
Christa: And the air on the outside's pushing it down.
Adele: So it's hard to pull up.

The educator finally let the learners explore the ideas and construct the scientific knowledge on their own:

Adele: How is it when you put it down and then you pull a little corner up it slips up?
Educator: Oh, that's a very good question. Do you want to think about that for a minute?
Adele: It's, It's...
Christa: No, I'II show you what it is. It's the air; it can get back in, can't it?
Adele: Yeah, it's getting back in it, so the air's pushing it upwards, isn't it?

It can be seen from this extract of classroom discourse that the educator engaged learners in activities and discussion about shared physical events to support them in constructing the scientific way of knowing. The CLIS project exemplifies how well constructivist teaching can be implemented in classroom settings.

2.2.3 Learning as a Social Experience

A body of literature emerged towards the end of the 1980s, in which learning was viewed as a social act, taking place in a social context (Brown, Collins and Duguid, 1989; Collins, Brown and Newman, 1989; Greeno, 1989; Lave, 1988; Schoenfeld, 1989). This school of thought used the metaphor, learning as participating in communities of authentic practice, and learning as "...an aspect of participation in socially situated practices" (Lave, 1996:150).

According to Lave and Wenger (1991), in the process of legitimate peripheral participation, when the novice moves from the periphery of the community of practice to its centre, he/she becomes more active and engaged with the culture and thus assumes the role of expert. The newcomers steal the knowledge that they need by legitimately and peripherally participating in authentic social practice (Brown & Duguid, 1996). Learning in this view is conceived of as belonging to and participating in that which embodies certain beliefs and practices. "A person's intentions to learn are engaged and the learning is configured through the process of becoming a full participant in a socio-cultural practice" (Lave and Wenger, 1991:83).

This notion of enculturation is central to the paradigm of situated cognition, in which learning is viewed as a cultural activity. Brown, Collins and Duguid (1989:32) argued that: ".... knowledge is situated, being in part a product of the activity, context, and culture in which it is developed and used"

Lave (1988) contended that cognition is situated in the practical of doing just plain folklores and knowledge is distributed not only amongst people but also across cultural artefacts. For instance, seamstress' apprentices learn not only how to make dresses but also certain ways of speaking and behaving as a seamstress, in order to become a legitimate participant of the social group. This is in line with the Greeno and The Middle-School Mathematics Tough Application Project Group (1998) argument that learning is identity shaping. Individuals participate in different communities of practices and achieve their identity in each community through their personal trajectories of participation, i.e. changing participation of the learner in the community of practice (Wenger, 1998). The striking feature of situated cognition can be depicted as (Bredo, 1994:29): "shifting the focus from individual in environment to individual and environment."

Within this paradigm, the focus is on socio-cultural forms of learning, and the unit of analysis is not the single individual but the social setting. Researchers such as Lave (1988, 1991) and Suchman (1987, 1993) discuss the cultural construction of meaning and argued that learning should be studied as a social, collective phenomenon (Lave, 1996). According to Lave and Wenger (1991:15-16),

> ...learning is a process that takes place in a participation framework, not in an individual mind. This means, among other things, that it is mediated by the differences in perspectives among the co-participants. It is community, or at least those participating in the learning context, who learn under, this definition. Learning is as it were distributed among co-participants not a one person act.

Other researchers such as Collins and Brown (1998) have tried to honour the situated nature of knowledge and to accommodate the situated

perspective in designing instructions for formal learning. It was the opinion of Collins and Brown (1998:17) that:

> ...we need to organise learning environment and activities that include opportunities for acquiring basic skills, knowledge, and conceptual understanding not as isolated dimensions of intellectual activity, but as contributions to learners' development of strong identities as individual learners and as more effective participants in the meaningful social practices of their learning communities in school and elsewhere in their lives.

An example of this approach is the cognitive apprenticeship model of Brown, Collins and Duguid (1989), in which novices (i.e. learners) are enculturated into authentic practices of experts through social interactions and activity, and which bears a resemblance to the traditional craft apprenticeship. The term apprenticeship suggests the centrality of practice in learning and highlights the context-dependent, situated and enculturating nature of learning. The term cognitive emphasises the difference between traditional apprenticeship and cognitive apprenticeship, in the sense that the latter goes beyond the learning of physical skills. Its objective is to develop expert practice through situated learning.

According to Brown, Collins and Duguid (1989:40), "cognitive apprenticeship attempts to promote learning within the nexus of activity, tool and culture". For these researchers, the components of cognitive apprenticeship are apprenticeship, coaching, repeated practice, articulation, reflection, collaboration, technology, and stories. Collins, Brown and Newman (1989), presented a modified version, which was

composed of four building blocks namely: content, methods, sequence, and sociology.

In terms of *content*, learners need to have four types of expert knowledge: domain or explicit conceptual knowledge; factual knowledge; procedural knowledge in relation to expertise of a domain; and strategic knowledge. The last strategic knowledge includes:

- Heuristic strategies, or 'tricks of the trade' which represent the problem-solving strategies that experts obtain with experience;

- Control strategies, or knowledge that experts have in relation to managing problem-solving and which comprises goal setting, strategic planning, monitoring, evaluation, and revision;

- Learning strategies, or knowing how to learn, which includes exploring a new domain, extending one's knowledge in a familiar subject, and reconfiguring the knowledge already possessed.

In terms of *method*, the goal is to help learners integrate cognitive and metacognitive strategies for managing and discovering knowledge in the progressive process of enculturation. Learners should have the chance to observe, engage in, invent, or discover expert strategies in content, so that they are encouraged to explore and to be independent.

The methods proposed include:

- Modelling, or inviting an expert to perform a task and model their strategies for learners, which provides modelling in situ;

- Coaching, or offering hints, feedback, and reminders to learners on those aspects that may go unnoticed;

- Scaffolding and fading, or the provision of support for learners' attempts to perform the task, where the educator gradually hands over the control of the learning process to the learner, i.e. fading;

- Articulating, encouraging learners to express what and how they learn through inquiry teaching, talking aloud about their problem-solving processes or taking a critic's role in co-operative activities;

- Reflection, or enabling learners to compare and reflect on their own problem-solving processes with those, who could be the expert or other learners;

- Exploration, or empowering the learners to move further independently by setting the problem and solving it on their own.

With regard to *sequencing,* it is important to structure the learning activities in such a way that learners are able to develop the multiple skills required in expert performance, and identify the conditions under which the knowledge can be applied. This necessitates the construction of a sequence of learning tasks that are increasingly complex in nature with increasing diversity, and which provide the chance for learners to develop a feel for the overall terrain before focusing on the details.

The final aspect of Collins, Brown and Newman (1989) four building blocks of cognitive apprenticeship is *sociology* of the learning environment, in which five characteristics are identified:

- A culture of expert practice, or the creation of an environment in which learners communicate about, and engage in the skills involved in expertise;

- Situated learning, or the provision of an environment that reflects the multiple uses of what is to be learned by the learners in the future;

- Intrinsic motivation, or the promotion of learners' intrinsic motivation for learning;

- Exploiting co-operation, or having learners work together to foster co-operative problem-solving;

- Exploiting competition, or asking learners to do the same task and compare their achievements, which focuses on the learners' improvement.

During the seminal works of Collins, Brown and Newman (1989) and Brown, Collins and Duguid (1989), the Schoenfeld study (1983, 1985, and 1991) of teaching mathematical problem-solving was cited as one of the "success models" in terms of incorporating the key notions underlying the cognitive apprenticeship model. This study well exemplified

> ...the basic elements of cognitive apprenticeship, using the methods of modelling, coaching, and fading and of encouraging learners to reflect on their own problem-solving processes (Collins, Brown and Newman 1989:469).

For this reason, Schoenfeld's study has been chosen as a case to illuminate how the learning metaphor of participation is actualised in the classroom context.

2.2.3.1 Application of Learning as Social or Participation Metaphor to Instruction

Schoenfeld's attempt emphasised the creation of a "community of practices" in which the learners developed identities as active learners with responsibilities for what they learned. The focus of his method was to:

> ...generate mathematical practice and to show college learners how to think mathematically about the world, how to see the world through mathematicians' eyes, and, thus, how to use mathematician's tools, it provides learners with the opportunity to enter the culture of mathematical practice (Brown, Collins and Duguid, 1989:5)

Schoenfeld (1991) for example, described how he and his class were working collaboratively on the problem of a magic square, and needed to put digits from 1 to 9 into the nine boxes of the square so that the sum of the digits along each row, each column and each diagonal was the same. When they discussed whether they should place 9 in the centre of the square, they came up with the ideas of "focusing on key points that give leverage" and "exploiting extreme cases". In addition to teaching learners the use of heuristics, Schoenfeld endeavoured to reveal the way in which mathematicians think about the problem, and established with his class a

mathematical belief system based on his own as a mathematician. It was noteworthy that the class was working in the culture of mathematics, but not in the culture of schooling.

Schoenfeld (1983, 1985) used the basic elements of cognitive apprenticeship, i.e. modelling, scaffolding, coaching, and fading when he devised his course. He used the method of modelling to promote a new understanding of the nature of expert problem-solving when, at the start of every class, he offered to solve one of the difficult problems that he consciously asked learners to solve on their own. This in-class demonstration of problem-solving served to illustrate how an expert engaged in mathematical practice, and the necessary evaluation of the exploration.

In some cases the expert might fail to solve the problem at a particular moment, at which point not only is the use of heuristics and control strategies modelled, but also the way in which an expert handles failures. As Lave (1996) suggested, one learns subject matter by doing what experts do. Through the collaborative work involved in solving the problem and analysing the solutions, learners were helped to understand the nature of how mathematicians work and to participate in the "community of practice".

Schoenfeld (1991) adopted the next strategy of collective problem-solving with the whole class regarding some well-chosen problems. Learners were encouraged to generate alternative courses of action while Schoenfeld employed the method of scaffolding to support the learners' exploration by making decisions concerning the appropriate course to pursue. He

modelled the various control strategies for making judgements about what was the best way to proceed. Subsequently, he asked the learners to solve problems in small groups and employed the method of coaching. His role then became a "roving consultant" who performed the task of: "observing learners while they carry out a task, providing a 'guide on the side' who intervenes and provides scaffolding for learning to progress when necessary, but otherwise fades into the background, providing learners with opportunities for initiatives and self-directed problem-solving" (McLellan, 1995:11).

Schoenfeld (1991) asked learners to answer questions. As he moved around he asked questions such as: "What are you doing?" "Why are you doing it?" Progressively, the learners learned to generate questions of this type by themselves and to discuss the answers in advance, which helped them to develop reflective and metacognitive skills. Finally, he adopted the method of fading in such a way that learners were given the opportunity to explore the entire problem-solving process by themselves.

Concerning the dimension of sequencing, Schoenfeld (1983, 1985) systematically increased the complexity of his teaching. As he introduced new heuristics, he tried to exemplify it with problems in which the heuristics was particularly effective, and followed this by assigning a list of problems for learners to practise, of which one third involved the use of this heuristics.

With the introduction of more heuristics during the course, problems involving the integration of multiple heuristics increased proportionately so that learners progressively learned how to handle complex problems.

Schoenfeld (1983, 1985) also diversified his teaching, starting off by assigning learners with problems, all of which involved the use of the new heuristic taught, but with only the problem context varying.

This process came to include some problems for which the heuristics might not apply so that learners were able to develop the ability to differentiate the conditions in which the heuristics actually did apply. Finally, he included problems requiring a heuristics that served to prevent learners from learning to apply it mechanically. In this way, learners were trained to learn under which condition or in which context a particular strategy could be used, which concurred with the critical feature of situated learning.

Finally, Schoenfeld (1999) developed a culture of expert practice by showing the learners the cognitive processes that he, as an expert in mathematics, engaged in when solving problems. He made use of what he described as "post-mortem" analysis. After modelling the problem-solving process for a particular problem, he recounted the solution method and provided the "abstracted replay" in which some processes were recapitulated in order to direct the learners' attention towards the determining features of expert and learner performance (Collins & Brown, 1988). He evaluated the heuristics employed, the points where he engaged in generating alternatives, the rationale behind the selection of a certain alternative, and so on. Learners were also required to alternate with the educator in producing post-mortem analysis, which enabled them to compare and reflect on the problem-solving process of an expert. As Hennessy (1993:20) pointed out, cognitive apprenticeship: "serves to help learners to cope with novel problems and to progress from embedded activity to general principles of culture."

In this classroom strategy, learning mathematics is regarded as the practice of authentic activity rather than the articulation of academic knowledge. Learners are exposed to a culture's way of thinking and solving problems, and to its conceptual perspective when they are involved in working with and observing an *expert* solving problems. Thus, Schoenfeld's teaching well exemplifies the essence of the cognitive apprenticeship model in which learning is seen as participating in a community of practice.

2.2.4 Learning as a Phenomenographic Experience

This is the third paradigm of my ongoing discussions on perspectives on knowing. Phenomenography focuses on the understanding of people's experiences of the world, and which is distinguished from cognitivism and constructivism, for example, by its non-dualistic ontological stance. According to Marton and Booth (1997:122), "experiences do comprise an *internal relationship* between the subject and the world, and that is the fundamental characteristics: An experience is of its essence *nondualistic"* (italics as original). Unlike the previous mentioned metaphors, phenomenography draws upon notion of intentionality to characterise a non-dualist model of experience. According to Marton (1981), human experiences cannot be accounted for either by the elements of the situations or by the general cognitive functioning of the individual, as humans and the world are regarded as inseparable entities. Experience is characterised, as the internal relationship that is constituted between individuals and phenomena and the phenomenographer would study *the experience of learning* and the outcome of such a study would be

qualitative descriptions of the variation found in the experience of learning (Marton, Dall'Alba, and Beaty, 1993).

In phenomenography (details discussed later in this chapter), learning is seen as a change in one's way of experiencing. Learning is thus a process in which the learner reconstitutes the world, which he/she has already constituted. It is different from cognitivism which regards learning as a change in one's mental representations of the world out there; it is different from constructivism which conceives of learning as constructing an understanding of the world on the basis of knowledge which sees the social settings and cultural environments outside the individual as the fabric of knowledge. According to Marton and Booth (1997), learning takes place by a change in something in the world as experienced by a person.

The new way of experiencing something is constituted in the relationship between the experiencer and the experienced, and the descriptions of people's experience is content-oriented and as seen as a concrete case of human functioning (Marton, 1981). Erickson, (2000) suggested that this paradigm holds a more holistic position than other paradigms and thus the conceptual and empirical work which build on it should involve careful attention on the part of the science education community. In the next section of this chapter, various examples of applications of the phenomenographic metaphor to instruction have been presented.

2.2.5 Summary of Perspectives on Knowing

Three different metaphors of learning have been the object of this chapter. These metaphors espoused learning paradigms, namely learning as

construction (constructivism), learning as participation (situated cognition) and phenomenographic learning (variation). The most distinctive feature among these metaphors is that constructivist paradigm is grounded in a dualistic ontological position, whereby the world and learners are treated as separate entities. The constructivists argue that knowledge is constructed in one's mind, whereas the social learning advocates see learning in terms of interactions with the world, that knowledge is socially negotiated and embedded in a particular context, in the sense that knowledge cannot be separated from the practices and occasions of which it is the outcome.

According to the protagonists of constructivism, learning is described as the building of mental structures. The *building blocks* of understanding are the results of previous acts of construction, which means that a previously built structure forms the basis for ensuing constructions. Coming from this perspective, learning proceeds with construction, in the sense that learners actively construct their knowledge on the basis of knowledge already held. Constructivism is in contrast with the advocates of situated cognition, who support the metaphor of learning as participation, which posits that learning is an aspect of participation in communities of authentic practice. This involves changing participation of the learner in the community of practice. Learning is thought of as identity shaping in which "people achieve their identity in each community through their personal trajectories of participation" (Pang and Marton, 2003:38).

Phenomenographic learning is different from constructivism in the sense that, learning is seen as a change in one's way of experiencing, learning is a process in which the learner reconstitutes the world which he/she has

already constituted. This is different from constructivism, which conceives of learning as constructing an understanding of the world on the basis of knowledge which the learner already holds. Phenomenography is also different from situated learning in the sense that the latter sees the social settings and cultural environments outside the individual as the fabric of knowledge. Despite the differences between constructivism, situated cognition and phenomenography, each paradigm deals with some very crucial questions about learning.

The first two paradigms are concerned with the arrangement of learning and teaching, rather than with how to deal with the object of learning. The present study is aimed at promoting learners understanding of certain problematic concepts in EMS; specifically at helping learners to develop a certain way of understanding an economic phenomenon, and so it is the object of learning that is the main focus, rather than the arrangement of teaching and learning. This is why phenomenography, which does focus on the object of learning and is oriented towards practice, has been chosen as the research approach for this study, as opposed to any other paradigm. It therefore provides the theoretical grounding for the instructional design of the study, because it fits the fundamental research question that this study is addressing and it falls within the field of education. Phenomenography is therefore discussed in detail in the next section under theoretical framework.

2.3 Theoretical framework

This section examines phenomenography, the research perspective on which this present study is based. In this theoretical study,

phenomenography is discussed by tracing its development through five stages (Pang (2002). These are:

- Investigating learners' differences in learning;
- Studying variations in people's way of experiencing;
- Developing an explanatory framework to characterise ways of experiencing;
- Applying the theory of variation to describe and analyse classroom teaching; and
- Designing learning environments inspired by the theory of variation.

According to Pang (2002), the first two stages belong to traditional phenomenography, and focus mainly on the qualitatively different ways of experiencing a phenomenon, whereas the last three stages are classified as the *new* phenomenography (Marton, 1999; Marton and Pang, 1999), in which the emphasis is on the development of the theory of variation to account for and develop a certain way of experiencing.

2.3.1 Phenomenography

2.3.1.1 Origin and Meaning

Phenomenography is a research specialisation with its roots in a set of studies of learning carried out at the University of Göteborg, Sweden, during the early 1970s. The word 'phenomenography' was coined in 1979 and it appeared first in the work of Marton (1981). Etymologically, it derives from the Greek words "phainemenon" and "graphen", which mean appearance and description, and phenomenography is thus concerned

about the description of things as they appear to us (Pang and Marton, 2003:175). Phenomenography thus evolved as a research specialisation aimed at "describing conceptions of the world around us" (Marton, 1981:178).

Fundamental to the understanding of the phenomenographic approach is the need to realise that its epistemological stance is grounded in the principle of intentionality, which embodies a non-dualist view of human cognition insofar as it depicts experience as an internal relationship between human beings and the world (Marton and Pang, 1999). The aim of this study was to describe qualitatively different ways of experiencing various phenomena. Methodologically, this implies a second-order perspective, through which the study seeks to capture how the world appears to other people (Marton, 1981). It is the researcher who senses this variation. The recurring principle in phenomenographic investigations is: whatever phenomenon or situation people encounter, a limited number of qualitatively different and logically interrelated ways can be identified in which the phenomenon or the situation is experienced or understood (Marton, 1994).

The object of research in phenomenography is to discover variation in ways of experiencing different phenomenon. The 'first face of variation' refers to the study of variation between different ways of experiencing the same phenomena, wherein the categories of descriptions and outcome space are instrumental to characterising how people experience reality (Pang and Marton, 2003). Most studies in this line of research would pose the question in the form of *what are the different ways of experiencing the phenomenon?* Phenomenography is an approach to research, the outcome

of which is a description of the qualitative variation in the ways a group of people experience a phenomenon (Trigwell, 2000). Phenomenography's contribution to education includes the area of student learning which provides descriptions of the variation in ways of experiencing the process of learning and teaching. The second contribution, according to Trigwell (ibid), is in descriptions of the qualitative variation in the way student's object of study is understood.

These studies show that there are a limited number of variants in the qualitatively different ways of conceiving of the object of study and that an awareness of this variation may be a valuable teaching aid. In terms of the phenomenographic studies, the perspective on learning outcomes is in contrast to views that a successful learning outcome is one in which a learner can accurately reproduce 50% or more of what they are being taught. It is also in contrast to related views that the product of learning is *more* knowledge: adding an extra amount to what is there (Trigwell, 2000). A teacher with a focus on the product of learning, as experiencing something in a qualitatively different way, is more likely to engage in teaching that explores variation in ways of understanding that illustrate variation in ways of understanding and encourage deep approaches to learning. To be able to see learning outcomes in terms of qualitative difference is an important part of good teaching (ibid)

According to Marton (1994), the point of departure in phenomenographic studies is one of the simplest observations that can be made about learning, namely that some people are better at learning than others. This observation led to the first question that led to empirical investigation:

- "what does it *mean* that some people are better at learning than others? which in turn led to the second question:
- *why* are some people better at learning than others?

In exploring the first question (Pong, 1999), a limited number of distinctively different ways of understanding the text were found, and they were revealed in the form of categories of description. A hierarchy was established by drawing on their logical relationships, and an outcome space was formed. In answering the second question, the finding was that there was a strong relationship between people's differing understandings of the text and their differing acts of reading, which supported the principle of intentionality (Pong, 1999). The qualitative differences in the outcome of learning were closely linked to the variation in approaches to learning the *deep* versus the *surface* approach that were adopted by the learners.

2.3.1.2 Different Phenomenographic Research Designs

For the purpose of the object of this study and also to provide a clear point of departure for the current research, it would be appropriate to briefly explain the different modes of phenomenography.

It should be pointed out however that this current study might fall into more than one mode. The modes described here could be represented as phenomenographic study designs.

2.3.1.2.1 Experimental Phenomenography

The main feature of experimental phenomenography is that in ascertaining the qualitative differences in learning, students are asked, under rather rigorous manipulated conditions, to learn from ordinary textbooks or text of corresponding quality. In subsequent controls, which could be repeated several times at various intervals, the focus primarily was directed toward the way students had understood the main point of the text.

The early beginnings of phenomenographic studies started as an experimental enterprise. Examples of Experimental phenomenography include Marton's 1975 research in which 30 students were asked to read an article of about 1400 words discussing a contemporary reform in Swedes Universities, (Anon, 2003). Other studies in experimental phenomenography include one by Dahlgren in 1975 in which he asked students to learn two texts about economics (see 2.4 of this chapter). Dahlgren used an experimental and control group when varying instructions. Another example of this type of phenomenographic design is Säljö's study in 1975 in which he manipulated "the learner's conception of the task" (Anon, 2003). As discussed below the most interesting findings from this design are the qualitatively different ways of understanding the same phenomenon as operationally defined by the texts to be learned.

These constitute an *outcome space* representing the different understanding of a phenomenon (ibid). Marton, Carlsson, and Halász (1992) studied two groups of secondary school learners on differences in understanding and the use of reflective variation in reading, through experimental phenomenographic studies.

2.3.1.2.2 Phenomenological Phenomenography

The essence of phenomenological design is that researchers ask for a description of what is actually going on in the subjects mind during the interview. Phenomenological criteria concern questions directed toward experiences of the learning process (Anon, 2003). An example of this approach can be traced to Theman's study in 1983 on "conceptions of political power". Another example is Neuman's study on "the origins of arithmetic skills", in which he seeks for descriptions of what is actually going on in the subjects' mind during the interview; that is, *the outcome of learning* (ibid). Compared with the experimental approach, which views the analyses and the description of outcome of learning as the phenomenographic enterprise, the Phenomenological Phenomenography perspective is directed toward the experiences of the learning process (ibid).

2.3.1.2.3 Naturalistic Phenomenography

Naturalistic phenomenography implies the possibilities for collecting empirical material for phenomenographic analysis from authentic social situations. This means collecting data about what actually happens in particular situations without direct involvement from researchers and then analysing that data phenomenographically. The essence with this research is that what is registered as data is also possible to observe naturally (Anon, 2003). An example of Naturalistic phenomenographic research is Lybeck's study on *Archimedes in the classroom* in 1981, in which Lybeck entered the life in the classroom to observe and record what happened

when instructions in physics dealt with the phenomenon of 'density'.

Through gathering and analysing dialogue between learners and learners, and educators and learners respectively, Lybeck established the existence of a number of conceptions of the phenomenon (Anon, *2003)*. The difference between this approach and the others stems from the fact that the phenomenographic study of conceptions by Lybeck (1981) took place in a school context and he made a rigorous account of his observations as well as reflections and analysis during his work

2.3.1.2.4 Hermeneutic Phenomenography

In terms of research methods, phenomenography is seen as more or less neutral from the point of view of specific methods. It represents, however, a distinctive perspective in which findings may be re-interpreted in ways that do not accord with their original meaning (Johansson, Marton, and Svensson, 1985). Under hermeneutic approach, research analysis is geared to interpreting texts or statements not originally made for the purpose of a phenomenographic analysis (Anon, 2003*).*

2.3.1.2.5 Discursive Phenomenography

This method is described as not directly related to an educational or learning context. Discursive phenomenography is related to the anchorage, origin or residence of the conceptions in a general and context-free discourse to be understood non-hermeneutically. It is viewed as the least sophisticated way of doing phenomenography, codified as: Conversation -transcriptions - compiling of statement - analysis-

conceptions (Anon, 2003). An example of this approach was pioneered by Säljö in 1979 titled "Learning in the learner's perspective. L: Some commonsense conceptions" (Anon, 2003:1). Another example is Marton's study on "Adult's conceptions of the world around us" (Anon, 2003:1).

In conclusion, the above phenomenographic designs have highlighted the kinds of complexities in phenomenographic studies. Nevertheless, these have also provided the reader as well as the researcher here with a framework in which to place this particular research project. As seen in chapters one and three respectively, the design framework for this study has been made clear to the reader.

2.3.1.3 Characteristics of Phenomenographic Research

Linked to the above main methodologies to phenomenographic study, Trigwell (2000:78) outlines what he calls the "five points of departure" of a phenomenographic research approach:

- Phenomenography is non-dualist rather than dualist, in the sense that reality is seen as being constituted as the relation between the individual and the phenomenon. Unlike the philosophies underpinning cognitivism and individual constructivism, for example, which see realities as being "out there", and consider the subject to be separate entity from the phenomenon or object (*dualist*), the phenomenographic philosophy is *non-dualistic.* The only reality in phenomenography is that it is constructed by the individuals involved in the research situation.

- Secondly, phenomenography is qualitative rather than quantitative: it can be seen as being philosophically or methodically qualitative. Its design can be described as emerging-categories identified during research process and context bound (Creswell, 1994).

- Second order rather than first order: In the first order approach, the researcher describes the phenomenon as perceived by him or her, whereas in a second order approach, it is the experience of the phenomenon as described by others that forms the basis of the researcher's description.

For example, in their research study on "the outcome space of some basic concepts in economics", administered on some students, Marton and Dahlgren (1976:49), described the levels of outcome, which constitute the outcome space of a certain concept. In his study on "conceptions of reality – A metatheoretical note", Marton (1981:177) describes the qualitatively different ways in which people experience and understand the various aspects of reality which make up an autonomous field of enquiry. All these examples illustrate the point that the research study followed a second order approach, as explained by Trigwell (2000).

- Phenomenographic studies focus on variation: This approach focuses on the key aspects of the variation in the ways a phenomenon is experienced. This is fundamentally different to most other research approaches, and has consequences, which must be taken into account. Firstly its focus is on the differences, aspects or ways of experiencing a phenomenon, which are common across the

whole sample. These results in an outcome space, which is a partial description of the experience of the phenomenon, rather than a full rich description as might be expected using a phenomenological approach. Second, because the focus is on variation in ways people experience a phenomenon, the study must include a range of individual's experiences and the sample is selected to maximise the possible variation (Trigwell, 2000). The concept of variation as point of departure for phenomenography has been the main theme for this current research study. The outcome space for this research study concentrates on those aspects of the experiences, which *vary*.

- Articulation of the internal relations between the different ways of experiencing a phenomenon: It is this element that distinguishes phenomenography from outcomes with the lists of essentially unrelated categories, such as in a content analysis.

In addition to the variation in experiencing, phenomenographic studies often reveal the internal relations of the categories of descriptions of the hierarchy of the structural component of the conceptions. Studies by Marton and Dahlgren (1976), Marton and Säljö (1976a) Marton and Säljö (1976b), Marton and Säljö (1976)c, Marton, Carlsson and Halász (1992) and many others have tended to establish internal relations of the categories of description.

2.3.2 Recent Developments in Phenomenography

The above explanations of phenomenography have pointed to two main directions, *firstly* the focus of the initial studies was the set of different

understandings of some specific content which learners developed in a certain situation; sense was made of these in terms of differences in the approaches the learners adopted to the specific learning task – i.e. in terms of differences in their way of experiencing the specific situation. *Secondly*, there was a shift in focus of interest away from that which emerges in a specific situation and towards the learners' preconceived ideas about the phenomena dealt with in the specific situations. For example, according to Neuman, 1987, the way in which children understand numbers is of vital importance for the way in which they deal with arithmetical problems. Also the way in which students understand matter is of vital importance as far as their understanding of chemical reaction is concerned (Renström, Andersson, and Marton, 1990). In other words, there is a shift in focus from the descriptive to the theoretical, such as asking what critical aspects of a phenomenon are discerned by the learner for the constitution of a particular way of experiencing some phenomenon (Pong, 2000 and Runesson, 2000), and how different ways of experiencing a phenomenon may evolve (Marton and Pang, 1999).

Linder and Marshall, (2003) argue that the experience of given *patterns of variations* is a necessary but not sufficient condition needed to foster learning, which is about coming to experience phenomena in new ways. They talk of using alternative modes of thematization to generate variation as part of the process of learning, to resolve complexity, confusion, and puzzlement, particularly in discipline-based problem-solving situations.

Mindfulness is used as 'reflection' to be included in the phenomenographic anatomy of awareness. From a theoretical perspective, therefore, Linder and Marshall (2003:282) argue that "from the phenomenographic

perspective learning cannot take place without discernment, discernment cannot take place without variation, and the search for variation is driven by the relevant structure brought to the learning situation".

2.3.2.1 The Variation Theory of Learning

According to Marton and Pang (1999), every phenomenon can be experienced in a finite number of qualitatively different ways and in order to characterise the variation in ways people experience various phenomena, it is important to understand what it means to experience a phenomenon in a particular way. In response therefore, phenomenographic research has moved on to attempt to address questions such as 'what is "a way of experiencing something"?' or 'what is the actual difference between two "ways of experiencing the same thing"?' (Marton and Pang, 1999:4). According to the variation theory, *a way of seeing* can be defined in terms of critical features that must be discerned and focused on simultaneously, (Martin and Booth, 1997; Bowden and Martin, 1998; Marton and Tsui, 2004).

In this theory, what is learned is of central importance. What is learned (and what should be learned) *is the object of learning*. Object of learning refers to a capability or a value to be developed in the students, but this study restricts ourselves to the former. The object of learning in the present study is "being able to think in terms of price determination of the Rand when this is relevant". But the intended object of learning as such can never affect the learners directly. According to Pang and Marton (2003), learners are at best, affected by what takes place in the classroom. They encounter the object of learning in the way in which it appears in the

classroom; so only *the enacted object of learning* affects them. Pang and Marton (ibid) argue that as educators, we describe the object of learning in terms of our own theoretical inclination and we describe how the object of learning can be possibly learned in particular settings (ibid).

Furthermore, and based on the above argument, we cannot assume that learning will take place, but we can assume that learning *might* take place. To make it possible for the learners to develop a certain way of seeing something, the pattern of variation they must necessarily experience has to be constituted. The qualitative differences in the outcome of learning were closely linked to the variation in approaches to learning (the deep versus the surface approach) that would be adopted by the learners.

Phenomenography has evolved into a distinct research specialisation through various studies and its main focus is aimed at describing qualitatively different ways in which people make sense of various kinds of phenomena in the world around them. The question centres around "the different ways of experiencing the phenomenon" and "how these are related to each other". The descriptions of people's experience were seen as concrete cases of human functioning, primarily at the collective level (Marton, 1981:178). These categories of descriptions that correspond to those varying understandings, and thus the outcome space, constitute the main results of phenomenographic research. Linder and Marshall (2003:274) argue that "a way of experiencing something depends on which constituent parts are discerned and appear simultaneously in the learner's focal awareness, and which parts or aspects recede into the background".

The present study has been embedded within the phenomenographic research studies and the focus was on variations of learning of certain selected economic concepts as explained in chapter 1.

2.3.3 Phenomenography applied to Learning and Teaching

The view of phenomenography is that learning is a matter of seeing, or experiencing, something in a new way. The theoretical descriptions mentioned above are grounded in empirical research on learning. These theoretical descriptions are used for analysing learning as well as teaching as such. To investigate the teaching of *foreign exchange market,* from the described theoretical perspective, implies analysis of how different aspects of the content are focused upon or thematized, which aspects are left un-focused and whether the focused aspects open up dimensions of variations or not (Runesson, 2000). From the theoretical underpinnings of this research it follows that variation plays an important role in the teaching-learning process.

2.3.3.1 Metaphor of Learning and Teaching

Pang (2002) refers to the concept 'metaphor of learning' to reflect the view of phenomenography that learning is a matter of seeing, or experiencing something in a new way. Thus learning entails discerning, or experiencing certain aspects of something in one's awareness. According to Marton and Booth (1997), learning is a *change in one's structure of awareness*, i.e. those aspects of phenomenon, which are "figured" or highlighted simultaneously in a person's awareness at a particular time, or *an increase in one's ability to see or experience* something in a certain way. Bowden

and Marton (1998) are of the opinion that people can build up their competence in seeing, that is, understanding the world to deal with the new situations in the future. Bowden and Marton (ibid) pointed out that discernment "is defining feature of learning in the sense of learning to experience something in a certain way" (p.35). Learning is thus associated with a change in discernment, which entails a change in the aspect(s) of the phenomenon in the focal awareness of the learner: in other words, a change in the way of seeing the phenomenon.

According to Runesson (1999) when teachers are studied in action communicating content to the learners, they demonstrate an orientation to the content taught. This ability to constitute space of variation seems to be a tacit dimension of teachers' knowledge, a *knowledge in action*, which can be described in terms of *content knowledge* and *pedagogical content knowledge* (Molander in Runesson, 1999).

A study conducted by Leveson (2003) on how academics experience their teaching approach with first year university accounting students shows that what teachers regard as relevant student experience for learning is strongly related to how they approach their teaching. Those adopting a teacher-focused approach seem to consider only subject experience to be relevant. In her study into the process of discovery of intra-individual variation in accounting teaching, Leveson (ibid) concluded that it is important to ask the right questions as well as for the teacher to be totally clear about the questions, the subject and the information required.

Methodology also seems to have a potential for revealing aspects of the teaching process that are hidden when other methodology is used

(Runesson, 1999). Several phenomenographic studies (Alexanderson, 1994, Andersson and Lawenius, 1983; Annerstedt, 1991), based primarily on interviews, have given accounts of the aspects of the teaching situation that are in teachers' focal awareness. From these studies it can be concluded that when teachers in an interview are asked to talk about their teaching, they do not, to any great extent, discern aspects of their professionalism that are related to the specific content their learners should learn. Thus the issue of tacit knowledge and action knowledge come into play here.

In her study to establish the different ways in which teachers deal with the content when teaching fractions and percentages, Runesson (1999) established that the ability to constitute a space of variation is related to the way the content is understood by the teacher, and the way fractions and percentages were presented presupposed a way of experiencing them. In the teaching situation, the teacher must be able to discern critical aspects of the content and critical aspects of a pupil's learning simultaneously, and this must be done against a background of an experienced variation of the aspects.

In conclusion, it can be stated that learning and teaching are very complex phenomena. Teaching has dimensions other than learning and there are probably other constraints and possibilities for learning than the space of variation that is constituted in the classroom as well.

A way of seeing something is thus conceived of as "the set of different aspects of the phenomenon as experienced that are simultaneously present in focal awareness" (Marton and Booth, 1997:101), and learning is seen as

a qualitative change in one's way of seeing. This amounts to being able to discern certain aspects of the phenomenon that one could not previously discern, and to keep them in focal awareness.

2.3.4 Learning as Experiencing

Knowledge can be distinguished between *episteme* (explanatory knowledge, understanding) and *techne* (know-how, ability to perform). According to Bogenrieder and Nooteboom (2003), studies of memory yield a distinction between *declarative* memory (knowledge of facts, explanations) and *procedural* memory. Procedural knowledge is, like techne, ability to perform. It is non-canonical, and embedded in practice, or practice-bound (Wenger, 1998). Another distinction is that between 'tacit' knowledge, which is locked in the mind, and *codified* knowledge, which can be documented. It is important to note that techne (procedural knowledge), being practice-bound, is highly, but not necessarily entirely, tacit (Bogenrieder and Nooteboom (2003).

To become knowledge, information needs to be interpreted in a cognitive framework and therefore information is not the same as knowledge. Knowledge and the meaning of words are not independent from context. They lie partly in the context of use, and they shift from one context to another (Bogenrieder and Nooteboom (2003). The theory of knowledge states that cognition takes place on the basis of mental categories (models or schemata) that are partly developed in interaction with one's physical and social environment. Those categories constitute one's absorptive capacity, which relates to one's ability to perceive, interpret and evaluate phenomena (Bogenrieder and Nooteboom (2003).

Interpretation, in the transformation of information into knowledge, entails integration with existing knowledge (Ausubel, Novak and Hanesian, 1978). This may yield novel associations, yielding new insight into logical or casual relations (Bogenrieder and Nooteboom, 2003). Those associations provide the basis for evaluation of utility or value, on the basis of means-end relations. This action precludes objective knowledge or at least any certain knowledge as to whether, or to what extent, knowledge is objective. According to Weick (1995:1-5), this process is referred to as "constructivism", "interpretative" or "hermeneutic" view because we form perceptions, interpretations and evaluations according to cognitive or mental categories. The extent that interaction between people is sustained and intensive will yield shared or similar mental categories, (Bogenrieder and Nooteboom, 2003).

According to Marton (1994), an experience of a phenomenon is a way of delimiting parts of the phenomenon and relating them to each other and to the whole. Based on his research on phenomenography, learning outcome was characterised into two aspects, namely the *content* aspect and the *act* aspect. The latter relates to the way students experience the learning situation, which he calls the *deep approach* and the former relates to the way students understand the content of learning, i.e. *the surface approach* (Marton, 1994). Svensson (1984), on the nature of experience, explained that delimitation from and relating to a context is the external horizon of the phenomenon. The delimitation and relating of parts is the internal horizon of the phenomenon. Thus the external and the internal horizons together make up the structural aspect of the experience. In her opinion (Svensson, 1984) the structural changes cannot come about without the

changes in meaning. Nor can changes in meaning come about without changes in structure.

What does experiencing mean? In any situation we are simultaneously aware of the here and now, and of the past, although not in the same way. Some things are focal in awareness; they make up the figure, whereas others are more peripheral (Runesson, 1999). Based on the theory of gestalt, theme and thematic field, Marton and Booth (1997) recently advanced a theory concerning the structure of human awareness. They took the way of experiencing as basic unit, analysed from a structural viewpoint, and suggested two constituting aspects of awareness – (i) the delimitation of a theme from the context; and (ii) the discernment of the parts that contribute to the theme.

The delimitation of a theme further suggests that certain elements or aspects of the context come into our focal awareness to constitute the theme (or figure) whilst other aspects recede into the background or form the backdrop (or ground) of a particular understanding (Pong, 1999). Marton and Booth (1997:87-109) argue that experiencing "something" as "something" is related to the way our awareness is structured at a certain moment. To be able to experience "something" as "something" – a physical object, a text or concepts like *supply*, *price demand*, *exchange rate*– certain aspects of the object have to be discerned and held in the focal awareness simultaneously. The object must be discerned from its context and certain aspects of the object must be discerned and related to each other and to the whole (Runesson, 1999).

The aspects of the object that are discerned and the relation between them that are held simultaneously in the individual's focal awareness, define the individual's way of experiencing the object. From this theoretical exposition, it follows that experience is formulated in terms of the structures and dynamics of human awareness. A way of experiencing a phenomenon, a situation and a problem is thus defined as the aspects of the phenomenon, the situation and, the problems that are discerned and simultaneously present in the individual's focal awareness (Runesson, 1999). However, it must be noted that being aware of these aspects does not mean that one is not aware of other aspects of the situation, only that they have not been in focus and therefore become discerned (Pong, 1999). Those aspects that are discerned represent different dimensions of variation in awareness (chapter 4, sections 4.3 and 4.5 respectively).

From this point of view, learning is seen as a change in the learner's capability of experiencing something in the world (Marton and Fazey in Runesson, 2000). This implies that learning means that more of other aspects of the object are discerned and related to the whole or that aspects are discerned differently. Learning is then seen as a change in the structure of the individual's awareness (Runesson, 2000). How do we learn to discern those aspects? How do I learn to experience the object in front of me as a non-transparent purple vase? The answer is: by experiencing a variation in certain respects. To be able to discern those aspects of the vase I must relate them to potential dimensions of variation.

The *purple* of the vase for instance, refers to a value in the dimensions of colours. In order to be able to discern the purple colour, I must previously have experienced other colours, like green, red, or white, and in order to

experience it as a non-transparent vase, I must have seen vases made of glass, for example. The way the vase is experienced, the meaning I assign to the object, is a function of the dimensions of variation through which it can be seen. According to Runesson (2000:3), "to be able to see what the case is, I must be able to see what is not the case". Thus discernment, simultaneity and variation presuppose, and are logically related to, each other. This implies that the awareness has a structure and the way the object is experienced can be described in terms of the structure and organisation of the awareness at a certain moment. Structure and meaning are thus dialectically intertwined: meaning presupposes structure and vice versa. Marton (in Pong, 1999:3) was of the opinion that "the qualitatively different ways of experiencing various phenomena can thus be understood in terms of the differences in discernment, simultaneity and variation at a deeper layer of the field of awareness connecting the person and the world."

2.3.5 Studying Learners' Differences in Learning

Phenomenography as mentioned earlier on, is a research specialisation that was developed by Marton, Dahlgren, (1975, 1975) Säljo (1976a, 1976b) and Svensson (1975) at the University of Göteborg in Sweden during the early 1970s, and its roots lie in a set of empirical studies of learning involving Swedish university students (Dahlgren, 1975, 1975; Marton, Dahlgren, Säljo and Svensson, 1975; Marton and Säljo, 1976a, 1976b). In contrast to previous research, which had concentrated on the quantitative properties of the learning process, the focus of these studies was on the relationship between the process and the outcome of learning. The group

was interested in what the students learnt, rather than how much they learnt (Pang, 2002).

Phenomenography study was first conducted on student learning and included descriptions of the variations in ways of experiencing the process of learning, and also included descriptions of the variation in the ways of experiencing the processes of higher education (Marton, Hounsell and Entwistle, 1997). More recently attention has been turned to teaching (Kember, 1997; Proser and Trigwell, 1999).

Another contribution of phenomenography is in its descriptions of the qualitative variation in the way learner's object of study is understood. Studies have shown that there are a limited number of variants in the qualitatively different ways of conceiving the object of study and that an awareness of this variation may be a valuable teaching aid (Trigwell and Shale, 2004). According to Booth (1997), phenomenographic research has tackled questions concerning the variation in ways in which people experience the phenomenon they meet in the world around them.

The empirical work directly addressing educational issues has to a large extent focused on describing qualitatively different ways in which particular sorts of student understand a phenomenon, or experience some aspect of the world, which is central to their education, and then setting the results into the educational context of interest (Booth 1997). In studies conducted by Dahlgren, 1975a, 1975b; Marton, Dahlgren, Säljo and Svensson, 1975; Marton and Säljo, 1976a, 1976b), two fundamental questions were investigated, namely: a) what does it mean that some people are better at

learning than others? b) why are some people better at learning than others?

The aims were to understand and explore the meaning of the differences in learning between students by ascertaining the kind of meaning that the learning event (the situation, the task, the content) had for students. The researchers did not presume that they already knew what 'being better at learning' implied, but instead, studied student experiences of learning, asking why some were better at learning than others, and seeking the meaning of that difference.

In these studies, individuals were asked to read a text about a certain topic, such as about the effects of education on individuals and society (Marton and Säljo, 1976b; Säljo, 1975), a critique on proposed university reforms in Sweden (Marton and Säljo, 1976a), or on forms of learning (Säljo, 1982). In order to explore both the participant's understanding of the text and his/her experience of the learning event, after the text reading exercise the researcher conducted an interview with the participants, in which the participants were asked about what they understood as the message(s) of the text and how they had gone about the task of reading the text (Pang, 2002).

There were two major findings (Marton, Hounsell and Entwistle, 1997; Marton and Booth, 1997): firstly, in addition to the presumption that some students learnt better than others, the students actually learnt different things. There were a number of qualitatively different ways of understanding a particular text, and these ways were limited in number. The researcher was able to set up categories of descriptions to capture

these various understanding, and establish a hierarchy by drawing on the logical relationships between these different ways. In this way, an outcome space, which described the variation in the possible ways in which a phenomenon is understood, could be formed. Secondly, the students had different approaches to learning. Some adopted a deep approach, which stressed how the act of learning created meaning, whereas others used a surface approach that emphasised the fulfilment of minimal requirement. It was shown that the different approach to learning was a fundamental aspect that caused differences in the outcome of learning.

The process and the outcome of learning were found to be internally related. Qualitative differences in the outcome of learning were closely linked to the difference in the approach to learning (the deep versus the surface approach), and expressed in terms of the different ways of experiencing a specific situation. It was shown that a strong relationship existed between the understanding of a text itself and the act of reading (Marton, Hounsell and Entwistle, 1997). These studies were later replicated in learning situations other than reading texts, such as problem-solving (Laurrillard, 1997), writing essays (Hounsell, 1997), attending lectures (Hodgson, 1997), and writing programmes (Booth, 1992). These initial studies helped phenomenography to evolve into a distinct research specialisation which aimed at describing qualitatively different ways in which people make sense of various kinds of phenomenon in the world around them (Pang, 2002). This study investigated the learning study as a tool for improving outcomes of learning.

2.3.6 Describing Qualitatively Different Ways of Experiencing - Awareness

On the issue of the "anatomy of awareness", it was explained that "a way of experiencing something", the unit of research in phenomenography, is related to how people's awareness is structured (Marton and Booth, 1997:82-109).

It contains both a *what* aspect, which corresponds to the object itself, and a *how* aspect, which relates to the act, and can be couched in terms of a dynamic relationship between the two aspects of the phenomenon, i.e. the structural aspect and the referential, or meaning, aspect. The structural aspect of a way of experiencing phenomena, which constitutes its meaning, is twofold. *Firstly*, for something to come to the fore is for it to become figural and thematized (Pang, 1999), and it implies that other characters have receded to the ground or margin and remain tacit. In other words, to experience something in a particular way, there is always a discernment of the whole from the context. *Secondly,* a figure is composed of its component parts and the interplay of each part contributes functionally to the whole figure, which carries an overall meaning.

The process of discernment involves the delimitation of the parts and their relationship within the whole (Svensson, 1984). It is concerned with both the experiencing and the experienced. Furthermore, in order to discern something from its context, we have to assign it a meaning and see it as a particular thing. The enigma of what it takes to experience something in some context according to Pang (2002:5) "is that to see something as something, it necessarily implies that we have identified it as something already, otherwise we could not discern it from its context at all. That is

what we refer to as the referential aspect that denotes the overall meaning assigned to a phenomenon". Structure presupposes meaning and, in reciprocal, meaning presupposes structure, which implies that these two (structure and meaning) aspects of awareness dialectically constitute each other, which provides a theoretical framework for understanding a way of experiencing a phenomenon (Marton and Pang, 1999).

According to Marton and Pang (1999), in order to understand the ways of experiencing a particular phenomenon, one has to conceive the four fundamental elements, which include: *discernment, variation, contemporaneousness and simultaneity.* They (ibid) further explained that the four elements constitute two systems: discernment – variation – contemporaneousness *and* simultaneity – discernment – variation; the former attempts to account for the experiencing of a particular aspect of a phenomenon whilst the latter tries to explain a particular way of experiencing a phenomenon. For example, we notice the pitch of a musical note when it is especially high or low. This we do against the backdrop of our previous experience of variation in the pitch. To experience that variation, we have to experience contemporaneously the pitch of notes that we have heard at different points in time. Otherwise the musical notes may just represent independent, discrete and free-floating instances and no variations can be observed.

The above discourse on experiencing a phenomenon qualitatively in a particular way implies that certain aspects of the phenomenon correspond to those dimensions of variation must have been discerned and the 'experiencer' has to experience them with other aspects simultaneously. A particular way of experiencing something thus represents an aggregation

of related aspects that are discerned and focused upon in a simultaneous way. A way of experiencing something therefore is seen as an internal relationship between the person (*the experiencer)* and the world (*the experienced).* It is a space defined by the dimensions of variation as experienced, i.e. a space of experiential variation (Marton and Fazey, 1997). The theory of variation within the context of phenomenography is discussed above.

2.3.7 Studying Different Ways of Learning and Teaching the Content

Learning is viewed as being a change in the ways in which one is capable of experiencing some aspect of the world and other research has been linked to attempts to bring about such changes by utilising certain approaches to teaching (Booth, 1997). A teacher with a focus on the product of learning as experiencing something in a qualitatively different way is more likely to engage in teaching that explores variation in ways of understanding that illustrates variation in ways of understanding and encourages deep approaches to learning. To be able to see the learning outcomes in terms of qualitative differences is an important part of good teaching (Trigwell, 2001).

Phenomenography is a research orientation, which attempts to identify, formulate and tackle certain types of research questions about learning and understanding in an educational environment (Marton and Booth, 1997). Learning is seen as a change in the learner's capability of experiencing a phenomenon and presenting it in focal awareness simultaneously. The question we are interested in is "how can we bring different ways of

experiencing something about?" According to Marton and Booth (1997), certain patterns of variation characterise certain ways of experiencing a phenomenon. In order to bring about a particular way of experiencing a particular phenomenon, it is necessary to follow that very pattern of variation.

The object of the study is to explore the extent to which educators' instructional methods are contributing to constitute the pattern of variation. Runesson's (1999) study on teachers' different ways of handling the fractional numbers and percentages in mathematics in Sweden supports this new theoretical orientation namely *variation*. The results of her study revealed that although teachers taught the same topic and in similar way, different teachers were found to have focused on and thematized certain aspects of the content and put other aspects into peripheral awareness. They opened up different dimensions of variation that constituted a space of variation so as to enable learners to discern critical aspects of the content. The implication of the study was that for learning to take place, critical aspects of the content and learners' learning should be discerned simultaneously by teachers against a backdrop of experienced variation of the aspects concerned (Pang, 2002).

The ability to constitute a space of variation is related to the way the content is understood by the teacher (Shulman, 1986). Teacher's knowledge can be described in terms of "content knowledge" and "pedagogical content knowledge" (Shulman 1986:26). The way content knowledge is presented presupposes a way of experiencing it. The ability to constitute a space of variation is a matter of experiencing the teaching

situation in a certain way. Experiencing could then be described in terms of discernment, simultaneity and variation (Runesson, 1999).

According to Runesson (1999), several phenomenographic studies based primarily on interviews have given accounts of which aspects of the teaching situation are in teachers' focal awareness. Conclusions from these studies included the fact that during interviews about their teaching, teachers do not, to any great extent, discern aspects of their professionalism that are related to the specific content their pupils should learn. However in her own studies Runesson (1999) concluded that all teachers demonstrated an orientation to the content as well as an ability to use variation when they focus critical aspects of the content being taught. It was therefore concluded that different methodology seemed to have a potential for revealing aspects of the teaching process that are hidden when other methodology is used.

It was the opinion of Runesson (1999) that teaching has dimensions other than learning and there are probably other constraints and possibilities for learning than the space of variation that is constituted in the classroom as well. Leveson (2003) in her studies on variation in the intra-individual experience of approach to teaching concluded that the demarcation derived from intra-individual variation is identical to that constituted from a comparison of teaching approach between individuals. Teachers, whose approach is wholly or partially student-focused, describe changes in teaching approach according to year level by focusing either on both the subject and the student or the student alone. Teachers, whose approach is teacher-focused, describe changes in teaching approach according to year level and focus primarily on the subject. In addition Leveson (ibid),

concluded that what teachers regard as relevant student experience for learning is strongly related to how they approach their teaching. Those adopting a teacher-focused approach seem to consider only subject experience as relevant; whilst student focused teachers consider personal life experience to be relevant as well.

Ahlberg (1992) also concluded that where pupils were given the opportunity to discover and learn mathematical procedures in connection with problem-solving, the pupils were able to embrace the ways of working as well as the content of the lessons. According to Ahlberg (ibid), when the teacher pointed out the different ways pupils had tackled the problem, mathematical ideas and principles were highlighted, (*student focus)* and rather than focus on the possible correct answer, the pupils attention was directed towards the range of different methods of solutions in the presentation. In their study Andersson and Lawenius (1983) discovered that teachers' conception of teaching is a complex phenomenon and it is only when conceptions are embedded in the teachers' real world that they become logical and comprehensible. Thus the differences in the context and content explain possible differences between individuals and between groups (ibid).

2.3.8 Phenomenographic Research Relating to Learning and Teaching

According to Entwistle, (1997), the phenomenographic research tradition has been developed as a qualitative descriptive research approach over the past almost 33 years. The first studies concerned why some university students were better at learning than others. To investigate this research

question, the focus was set on how students experienced and apprehended a text (Dahlgren, 1975; Svensson, 1976; Säljo, 1975). The results from these first studies indicated that the students understood the text in qualitatively different ways. Their answers formed the hierarchically ordered categories of description and these categories formed the outcome space. The outcomes of learning were found to be functionally related to the students' different approaches to a learning task (Rovio- Johansson, 1999). Two distinctly different approaches were found and these were labelled *surface approach* and *deep approach.* These studies gave the incentive for further development of the phenomenographic research approach towards a way of describing students' qualitatively different ways of experiencing phenomena in the world around them.

Later studies investigated the variation between qualitatively different ways of experiencing a phenomenon (Lybeck, 1981; Johansson, Marton and Svensson, 1985; Neuman, 1987; Renström, 1988; Strömdahl, 1996). In a study focusing on conceptions of matter in chemistry among students' aged 13-16 years in the upper secondary level, 6 different conceptions reflecting differences in focus constituted the variation in the internal structure of each conception (Renström, 1988). A phenomenographic approach was used when 20 transcribed student interviews were analysed. This variation can probably be found between different conceptions, the research group argued. "The idea is that when one is confronted with different problems, different aspects, certain insights have to be developed in order to solve the problem and in order to avoid contradictions" (Renström, Andersson and Marton, 1990:568). The results were interpreted as confirming the relation between the teacher's instruction of

specific aspects and the student's understanding of the relation between these specific aspects and the subject matter

In investigating how teachers' understood *the mole* concept and how their understanding was related to their students' understanding of 'the mole', Tullberg (1997) interviewed twenty eight teachers in chemistry in upper secondary schools and thirty students in grades 10 to 12, (aged 16 to 19), when the teachers were applying a new chemical method in their teaching. A phenomenographic research approach was adopted in the analysis of the transcribed interviews.

A main important finding was that the teachers' way of communicating 'the mole' to the students is influenced by the teachers' personal interpretations of *the mole* concept. In three out of four categories of description, the teachers' approaches of teaching 'the mole' were categorised as restrictive, with explanations and analogies referring to the micro-world *discontinuous perspective on matter*. Each of the three categories included an older definition of *mole* whilst the fourth category was in line with the current scientific definition. Here the teachers' explanations referred to the macro-world *continuous perspective on matter*. Tullberg (1997) argues that there is a variation in teachers' understanding of mole and that the dividing line among teachers goes between their perspectives. This means on the one hand teaching being framed within atomic theory and on the other hand by an integrative view of measuring. Two different approaches to teaching the *mole* were found. In *the coherent approach* the teacher used a central theme mirrored in all teachers' activities (Tullberg, 1997:60). The other approach was named *the fragmentary approach* in which the teacher had a guiding idea in which the parts were loosely linked (Tullberg, 1997:60).

The results showed that the students did not understand in which way "the mole" is related to other science concepts. Tullberg (1997) also found: "Neither the students nor the trainee teachers in the present studies had learnt the scientific view of mole" ((Tullberg, 1997:60). There were also similarities between her students' and her trainee teachers (eighteen trainee teachers in their final semester from a Teacher Training College), way of reasoning and depicting theories about the conceptual context in which the mole is set. Some students' learning difficulties with the mole can be plausibly explained in terms of teachers' conceptions of teaching, and more experienced teachers had distinctly different conceptions of how students should understand 'mole' probably because historically earlier conceptions of 'mole' are layered in a teacher's experience (Tullberg, 1997:117).

Tullberg (1997) argues that the teachers' conceptions explain the difficulties their students had, and that the "students learn to solve problems of a certain kind in a certain way" (ibid. 123). Only one student expressed a scientific understanding of 'the mole concept' and a teacher expressing that understanding in her teaching had taught this student.

The trainee teachers' individual teaching models were analysed in the same way as the teachers' individual teaching models and the results indicated that every model lacked statements corresponding to "the general idea" (teachers' general ideas about content and methods for the teaching and learning of mole) and every model represented a fragmentary approach to how to teach the 'mole' (ibid. 128).

In her research on the teachers' understanding of their discipline as a matter of teaching in relation to how their students understand the subject matter being taught, Patrick (1998) stated

> ...teachers are positioned as cultural agents, making curriculum – not merely interpreting and more or less effectively putting into practice a curriculum that had been fixed outside the classroom" (1998:4). From such a perspective the teachers' views of the curriculum, the subject matter and of teaching are critical in implementing and developing new approaches to teaching and learning (1998:288).

She points out that teaching a subject matter means more than translating written objectives. The problem-solving task was arranged in groups and the children decided which solutions they wanted to present to the class.

These children also met a variation of situations, when they confronted different sorts of learning tasks. In the end of the experimental phase, the children in the experimental group had become better at problem-solving than the control group. In a study of pupils in grades seven and eight (12 to 13 years of age) and how their five teachers taught fractions, Runesson (1999) found that all five teachers demonstrated an orientation to the subject matter content and an ability to use variation, although they were teaching in different ways. The teaching was studied from a learning perspective and the theory of variation was applied in the analyses of the teachers' lessons. Three different teaching objects were identified, which means that the teachers developed their own ways of varying the subject matter content and that these ways were possible to express in specific subject matter terms. The results showed that the teachers' own understanding of the subject matter as well as their attitude to the

students understanding, affected their way of teaching (Rovio- Johansson, 1999).

Teachers' approaches to teaching and their students' approaches to learning have been investigated in several studies by a group of Australian researchers (Trigwell, Prosser, Ramsden and Martin, 1998). In theses studies the teachers' view on learning has been mirrored in their way of approaching teaching. "The approaches adopted by a teacher in a particular context are a function of both the teacher and the context. For example, their approach to teaching of a general first year course may be quite different to their approach to teaching later years courses" (Trigwell, Prosser and Taylor, 1994:77). In this study five approaches to teaching were found. These were grounded in the teachers' intentions and strategies of teaching. In a later study congruence was found between science teachers' intentions and the strategies of first year university students. In investigating further the relation between teachers' approaches to teaching and the students' approaches to learning, Trigwell, Prosser and Waterhouse, (1999) used an inventory called *Approach to Teaching Inventory* to investigate the teachers' approaches to teaching. Students' approaches to learning were investigated by a modified version of the 'Study Process Questionnaire', developed by Biggs (1987); these questionnaires were factor analysed.

According to studies conducted by Prosser and Trigwell, (1999) and Trigwell, Prosser and Ginns (2005), teachers who reported using more of a student-focused teaching approach achieved a higher quality of approaches to learning, whilst classes of teachers using more of an information/transmission/teacher-focused approach reported more on

surface approaches to learning. In her study involving students' ways of experiencing and apprehending the subject matter in problem-solving process, Rovio-Johansson, (1999) established that the students' learning objects have similarities with teaching objects of the lecturers. Her findings included a claim that the students who managed to solve the problem, have experienced and discerned the critical dimensions of variation during their lectures and that they construe a learning object grounded in the lecture's content. The next section examines various phenomenographic studies in relation to EMS education.

2.4 Phenomenographic Studies on Learners in Economic and Management Sciences (EMS)

In this section, the focus is directed at discussions which centred on selected phenomenographic studies in Economic and Management Sciences (EMS). The rationale for this is to place the present study within the framework of developing student learning in Economic and Management Sciences (EMS). In this way, the researcher can firmly place the current study in a justifiable perspective. The impetus for more research into economic phenomena was identified strongly in the 1970s, when a number of researchers felt the need to investigate the role played by learners' experiences of economic phenomena in the curriculum, particularly directed at how children developed an understanding of economic concepts at different age levels (Pang 2002). Most of these studies were therefore aimed primarily to map out children's economic conceptualisations from pre-operational stage to the stage of formal operations, with reference to Piaget's stages of cognitive development (Berti and Bombi, 1988; Burris, 1983). Furham and Lewis (1986:44) put it

succinctly like this "most of the research studies have attempted to describe the stages through which children pass in their understanding of a specific concept. There is however, a good deal of disagreement about the number of stages, the points of transition and the exact understanding in each stage".

Despite the scarcity of phenomenographic research tradition in economics and management sciences, there have been some key studies investigating students' learning in the EMS domain. This chapter as pointed out above, also discusses the development of phenomenographical research in this content area, which mirrors the development of phenomenography, as described in the last section of this chapter, from the traditional phenomenography towards the 'new' phenomenography. The chapter also examines critically the state of EMS education in South Africa and its place in the school curriculum. The following sections however highlight some of the major phenomenographic studies in EMS education:

2.4.1 The Dahlgren (1975) Study of Non-verbatim Learning from an Economics Text

This study was conducted during the early phase of phenomenography, when its main aim was to study learners' differences in learning. This study can be described as one of the earliest phenomenographic studies in economic sciences. Conducted by Dahlgren (1975), the focus was on qualitative differences in learning as a function of content-oriented guidance. The study had two aims, namely: (a) to examine the effects on learners' learning outcome of experimental measures aimed at inducing deep-level processing during the reading of a text; and (b) to

describe the learning outcomes in terms of the variation in learners' conceptions of the basic economic concepts dealt with in the text in question (Pang, 2002).

The study began with 38 sociology learners at Göteborg University in Sweden. The respondents were randomly distributed to one experimental group and one control group of equal size. They were then asked to try to understand the first two chapters of an economics text by Paul Samuelson. Both groups were instructed to read the text very carefully, but for the experimental group, a set of experimental manipulations was introduced, which comprised: (a) an initial instruction aimed at depth and comprehension; and (b) 19 questions, which were written in the margin of Chapter One, such as "What does this mean?" "What does this imply", "Why is that?" and "What is the connection between A and B", which were meant to induce learners to develop deep-level processing and focus on the underlying structure of the discourse (Pang, 2002:145).

After reading Chapter One, the learners in both groups attended individual interviews in which the researcher asked the learners to recall the content of the text and then answer five questions, in order to explore their understanding of the basic concepts dealt with in the text. The researcher gave the learners some guiding questions or statements to assist the learner to arrive at a correct answer, whenever a student was unable to answer a particular question. Later the learners were instructed to read Chapter Two "in roughly the same way as the first", but they were encouraged to apply the experience gained during the reading of the first chapter. Both groups were asked to read the text without any adjunct questions.

After reading Chapter Two, a second interview was conducted individually and the procedure was more or less the same as for Chapter One. This time a colleague of the researcher, who did not have any knowledge of the learners' involvement in the first part of the experiment asked the learners to recall the content of Chapter Two as much as possible and answer five questions to test their understanding of the text. After that, the researcher took over the interview and invited the learners to undertake retrospection about their experiences of reading the text, of the retention tests and of the process of their learning (Dahlgren, 1975a)

The concepts and principles covered under the five fundamental topics in Chapter 0ne include the following: a definition of economics; the concept of scarce resources; descriptive vs. normative statements; statistical vs. casual relationships; and 'the fallacy of composition'. In Chapter Two, the three basic questions of resource allocation were covered namely: 'What to produce', 'How to produce' and 'For whom to produce', as well as the concept of the 'Production Possibility Frontier' the Law of Diminishing Returns and Malthus' Theory of Population.

The results of the study were twofold. For the experimental group, the learning outcomes were counter-intuitive. This means that despite the fact that the experimental group was given experimental manipulation to induce the use of deep processing in reading Chapter One, they performed worse in the retention test for Chapter One than their counterparts in the control group. However, they performed better on the retention test after reading Chapter Two, though the positive effect of the experimental procedure mainly applied to the questions on the Production Possibility

Frontier. As Dahlgren (1975b:50) pointed out, "the experimental manipulation seems to have had a slightly negative effect while in function, but a positive effect after its termination".

The result of the experimental group, as explained by Marton (1975), might be the result of what he called 'technification' (that is, the subjects were too occupied with the literal adjustment to the explicit demand by the instructions, and thus treated the means as an end), or influence of the "pointing out effect" on learners outcome, which resulted in an 'erosion effect'. This meant that the attention of the learners in the experimental group was so fixed on how to find answers to the questions in the margins, that they "defined the task in terms of the inserted questions in a far narrower way than was intended by the experimenter" (Marton, 1975:11). Consequently, they neglected the deep level of the discourse and the real intention behind the setting of the questions (Pang, 2002).

As far as the experimental manipulation was concerned, and as mentioned above, positive effects on the learning outcome in a qualitative sense were found in the case of *production possibility frontier*. This showed that the use of the holistic approach and deep-level processing in the experimental group was superior to the approach used by the control group with regard to this particular topic, and there was a close relationship between the process of learning and the outcome of learning (Pang and Marton, 2003).

Dahlgren's study also produced another major result, namely, the variation in the learners' conceptions of the basic economic concepts dealt with in the text. For example, take the Law of Diminishing Returns in Chapter Two of Samuelson' book. During the interview, in order to explore their

understanding of this economic concept, the learners were asked to design a table of data on their own to demonstrate the law, which states that the extra output gained will be successively lower "when we successively add extra units of a varying input to a fixed amount of some other input" (Samuelson, 1970:22). Based on the learners' answers, three qualitatively different conceptions were identified. At level A (the correct answer), the total output was described as increasing at a decreasing rate, having taken into account the second-order change (i.e. the additional output derived from adding extra the variable factor) decreased. At level B, the answers gave a series of figures for total output, which increased at the beginning but eventually dropped: for example, 1000, 1500, 2000, 1500, and 1000.

There was first an increment of total output and then a decline with no second-order change considered. Level C similarly included answers showing that the total output rose to a certain level and then remained unchanged, such as 1000, 1500, 2000, 2000, and 2000.

According to Marton and Dahlgren (1976), conceptions of the above economic phenomenon were ordered with respect to the level of complexity in the outcome space. The more dimensions of variation of the economic phenomenon that were focused on simultaneously, the higher the level the conception would be placed in the hierarchy of the outcome space. In this way, level A was deemed to be more complex when compared to the other two levels, as it simultaneously took into account the two dimensions of variations, i.e. the absolute change in the total output as well as the rate of change. However, the other two levels were considered to be indeterminate in the outcome, as both focused on one dimension of variation only (the absolute change of total output) (ibid).

The most important conclusion of this study was that: "the description of the outcome of learning in terms of the various conceptions of its content is the proper level of inquiry in research on non-verbatim learning" (Marton, 1975:10).

Marton and Dahlgren (1976) stated that it takes time to understand certain essential economic concepts and agreed that it is pertinent to describe what it takes to understand certain essential economic concepts and principles by revealing their distinctive features of comprehension. For example, for the law of diminishing returns, the distinctive feature of comprehension was the grasp of the dimension of variation of "the change in the rate of change". Those learners who could not discern this dimension could not fully comprehend the economic principle in question.

As Marton and Dahlgren (1976:110) argued:

> ...the critical difference between a correct conceptualisation of the concepts and principles and an insufficient subjective meaning of these is a matter of complexity. The former... represents a greater number of factors (dimensions, sources of variation) involved simultaneously.

Marton and Dahlgren's (1976) research paved the way for the development of the 'new' phenomenography, whose aim was to account for and develop a particular conception with the use of the theory of variation. The above study was a landmark in the development of phenomenography in the sense that it was the first attempt to provide a rich description of the qualitatively different ways of experiencing the phenomenon in terms of the dimension of variation to be simultaneously focused upon.

2.4.2 The Dahlgren (1978) Study of Learning and Teaching Economics in University

This study was done with students at Göteborg University, Sweden and the aim was to study the effects of a university course in economics on learners' conceptions of economic aspects of their everyday life, and thereby help to improve economics courses at university level (Dahlgren, 1978; Dahlgren and Marton, 1978). To begin with, there was a collaboration of a subject specialist and the educational researcher in reviewing the course content, identifying a number of basic economic concepts and principles, and designing problems in order to assess learners' comprehension of these concepts and principles.

To ascertain the extent to which the economics course influences learners' conceptions of real world phenomena, a group of fifteen learners were randomly selected, and interviewed individually both at the start of the term and when the course was completed. The respondents were required to answer ten questions, which related to their daily life and which called upon the use of the basic economic concepts learnt, such as the concept of price, the function of money, and devaluation.

The categories of description arrived at presented qualitatively different conceptions of particular phenomena, and each conception constituted a particular way of experiencing the phenomenon in question. For example, with the concept of price, learners were asked the simple question "why does a bun cost 50 ore?' This question was intended to explore the respondents' subjective meaning of the concept of price.

Two distinct categories, each containing two sub-categories, were found (Dahlgren, 1978: Dahlgren and Marton, 1978):

Category 1: The price is dependent on the relationship between the demand for and supply of buns.

1a: The price of the bun is determined by the market price of its constituents: in other words, the price depends on the supply and demand situations for example; wheat, flour and transport services.

1b The price of the bun is determined by the supply of and demand for buns. For example (Student 1): "If you consider this competitive model, so to speak, that's where demand and supply are in equilibrium, that point, it's a simple, sort of"

Category 2: The price is equal to the (true) value of the bun.

2a The price of the bun is the sum of the 'value' of its constituents. For example, (Student 2): "Yes, there is a lot of stuff in it, it's the material that costs money, the wheat, flour, and then to have it baked and wages.... and.... the costs of selling it."

2b The price of the bun is equal to its 'value'. For example (Student 14): "Because the producers have set a price. They have included all costs."

Category 1 answers indicated a conception of price as an entity, which was determined by a system in which the price is determined by the interaction

between consumers and producers in the market. Neither the cost of production nor consumers' willingness to pay can alone determine the market price. Category 2 revealed a more object-oriented conception of price, as these answers stated that the price represented the production costs and reasonable profits on the various constituents, and the focus was on the property of the object itself (Dahlgren, 1997).

In this study, learning was not conceived of as a discrete and self-contained entity, but one that enabled individuals "to consider afresh some parts or aspects of the world around them" (Dahlgren, 1997:34).

Learning was defined as a change in conception, a shift from one conception to another, which was qualitatively distinct. Hence the learning outcome for this course was assessed in a qualitative way. This would ensure an effective evaluation of the efficacy of this economics course. For instance, regarding the concept of price, learners who had really learnt from the economics course were expected to display a change in their way of seeing the phenomenon of price, by shifting their attention from the properties or costs of the objects to the interaction of market demand and supply in determining the price.

However, the data showed that the effects of the introductory economics course on helping learners to develop a more sophisticated understanding of some economic phenomena were limited. The main change was the acquisition of the terminology used in economics, and during the second interview learners were inclined to use the subject-specific vocabulary or jargon to express the same conception of the phenomenon that they had displayed during the first interview.

The contribution of this study to the development of phenomenography was that it extended the qualitative analysis of learning *beyond text comprehension.* In comparison with an earlier Dahlgren (1975) study, the phenomenon concerned in this study, such as the conception of price, was not about the meaning of a particular text, but drew on learners' experiences of the world and occupied a more prominent position in their everyday lives (Dahlgren, 1997).

The above study was the first attempt to examine the perceptions of economics learners concerning some economic concept *after* they had completed an economics course. In the study, the outcome space derived from the learners' interview data was used to evaluate the effects of formal education, in this case an introductory economics course, on student learning.

Furthermore, through examination of the variation in the conceptions of the economic concepts held by learners, the study was able to reveal learners' fundamental misunderstandings and in this way it might ultimately improve the quality of student learning (Pang, 2002).

The various conceptions of price which were identified in this study had a great influence on the later studies on economics education (Pong, 2000), in which the categories of description which were found to be more or less in line with this study. However one of the limitations, as in the 1975 study, was that the categories of description were not clearly delineated in terms of the dimensions of variation that were simultaneously focused on. Moreover, the focus of the study was on describing student learning in the

form of the conceptions held by learners, without much elaboration on how to improve instruction so as to help learners to learn better in formal education.

2.4.3 The Dahlgren (1979) Study of Conception of Price by Nursery and Primary Learners

This study was an extension of the 1978 project by Dahlgren to investigate the ways in which non-university learners conceived the concept of 'price'. He conducted interviews with 120 learners from nursery and primary schools in Sweden, (grade two, four and six), in which the learners were asked questions concerning the prices of commodities and their origin. The first question asked was:

1 Why does a bun cost one (Swedish) crown?

Question one was followed by two comparative questions in which learners were asked to explain why a bicycle commands a higher price than a ball, whilst a diamond ring is more expensive than a bicycle:

2 Why does a bicycle cost more than a ball?
3 Why does a diamond ring cost more than a bicycle?

The first question was then repeated:

4 Why does a bun cost one (Swedish) crown?

Dahlgren (1979) found out that unlike the earlier studies [Dahlgren (1978) and Dahlgren and Marton (1978)], the outcome space derived from this study was slightly different from that of the study involving the university learners. Instead of having two categories of conception of price, a total of *three* qualitatively different ways of experiencing the notion of price was identified. They were:

A Price is determined by the relationship between supply and demand for commodities.

B Price is determined by the value of a commodity or the accumulated value of its constituents

C Price is determined by properties of commodities other than value, such as taste, shape, and size.

Within the outcome space, category C was regarded as the least sophisticated conception in which the focus was on the physical characteristics of the commodity itself. This was preceded by Category B in which price was seen as a function of the property of the commodity, and it was more static and concrete. Category A was regarded as the most comprehensive in the sense that price was conceptualised in system-oriented terms: it was more dynamic and abstract in nature.

A noticeable finding from the study according to Pang (2002) was that the children's conceptions of price were unstable in nature, as many of them held different conceptions for different questions, and the changes in their conceptions of price were highly context-dependent. It was seen that only

2 out of 120 children held category A conception for the first absolute question about the price of a bun; whilst there were 32 children who held the category A conception in the context of the comparative questions, especially for the question "Why does a diamond ring cost more than a bicycle"? This indicated, "the conceptualisation can vary within individuals as well as, dependent on in which context the concept is introduced" (Dahlgren, 1979:6).

Although quite a number of learners expressed a Category A type conception in answer to the second comparative question, they did not manifest the same conception for the last question, which was a repeat of the first absolute question concerning the price of bun. For this question, most learners showed a similar conception to the one they had held when that question was first asked. The deduction that can be made here is that the effects of contextual variation on the categories of conceptions, which were formed by the children, were found to be of limited transfer value.

Furthermore, Dahlgren's 1979 study of the conception of price was the first study in economics that examined the conceptions held by learners *outside higher education*, i.e. those in nursery and primary schools. In terms of the development of phenomenography, it reaffirmed that there were a limited number of qualitatively different ways of conceptualising a particular phenomenon, in this case, the notion of price. This lent support to the basic tenet of phenomenography that there was variation in the ways that people experienced a particular phenomenon. Noticeably, the formation of a conception was found to be highly unstable and context-dependent, in that the learners' conceptions of the phenomenon of price changed from one context to another when different questions were asked.

According to Dahlgren (1979), the manifestation of different conceptions could be induced by asking learners different questions. This was supported by the fact that although many learners failed to demonstrate the economic conception when they answered the fourth question (the repeat of the first question), quite a number of them were able to express the conception relating to demand and supply in the third question, the comparison between a diamond and a bicycle. The instability of conception formation, which was shown in this study, challenged the idea that individuals have a stable pattern of thinking (that is, people hold the same conception of the phenomenon across different contexts), as implied by the Piagetian theory of developmental stages.

2.4.4 Thomas's (1983) Studies in Economics Learning and Teaching

Thomas's (1983) research among British learners was to investigate the 'psychological sine qua non' for understanding of a total of fifteen economic ideas and concepts, which included production possibility, the law of diminishing returns, price, income/wealth, money, costs, and opportunity cost. Thomas wanted to establish the most critical criterion, which distinguishes comprehension from non-comprehension of an economic concept, and subsequently to establish a framework for discussing curricular issues.

In the research, which used the Piagetian tradition as point of departure, Thomas followed Piaget's logico-mathematical constructs of concrete and formal operations in devising a series of tasks such as seriation, cross-classification, conservation, and compensation, which centred on the

various economic concepts. In the study, two hundred and thirty-seven 12-16 year old learners in British schools were asked to complete the tasks during individual interviews, which were conducted during one-hour period on ordinary school days. Their answers were coded and scored by referring to the descriptions of performance provided by Elkind, Piaget and Shayer.

An outcome of Thomas's study included her assertion that to improve the teaching of economics it was important to discover the psychological structure of an economic concept; that is, a structure that defines the indispensable conditions for comprehension. According to Thomas (1983:3), "the psychological structures exposed by the study were not a property of the material or of the discipline alone, but of learners' interaction with the experiences provided in the tasks". This means that the conditions come from the experiences of learners while interacting with the materials. In the study, for example, two questions were asked on price: 'what happens to the price of ice cream if it's a hot day and more people want to buy?' and 'What should I do if I want to reduce price of ice cream to its normal level?'

On the basis of the learners' responses, two conceptions of price were identified: in one set of answer, price was conceptualised as the mechanism which could eliminate excess demand or supply; and in another set of answers, price was conceptualised as relating to costs. Thomas (1983) argued that to comprehend the concept of price, learners need to focus on the instrumentality of price in eliminating excess demand or excess supply, rather than seeing it as being related to demand and supply in a separate manner. It was also established that the learners' everyday experiences of transaction within the economic system had given rise to

'misconceptions'; for example, learners saw price and cost as identical (Thomas, 1983, 1985). As time went on, her work was characterised by drifting away from the Piagetian framework to the phenomenographic framework (Thomas, 1991), which suggests that phenomenography is more effective in deepening learners' economic understanding. In the 16-19 economic research and development project (Thomas, 1994), Thomas and the group of teachers involved explored the perceptions of learners concerning both economics and the outcomes of studying economics.

Based on the results, they developed classroom materials and published them in 'Core Economics' (Economics and Business Education, 1995). According to Thomas and Wood (1997), in order to make research useful in teaching, it needed to be an integral part of the teaching and learning process. They proposed a two-phase approach to the research process: firstly, to identify the qualitatively different ways of understanding of the economic phenomenon in question; and secondly, to identify the sources of variation in experience. For example, in teaching the concept of price, teachers should start by identifying the possible conceptions that learners could hold for price, which could be categorised as outcome A- *seeing price as related to demand and supply* and outcome B- *seeing price as determined by costs*. Then the teacher would need to find out why people come to have different conceptions. The researchers argued that the emergence of different conceptions originated from the different aspects of the phenomenon that the learners attended to, that is, that the different conceptions are linked to experiences of variation in different aspects.

Those learners who conceptualised price as related to costs were attending to the goods and services that is, the properties of the object, while those

who saw price in terms of demand and supply were attending to the market for the goods and services. Thomas and Wood (1997:6) contended that:

> ... the understanding of price expressed in Outcome B is linked with experience of variation in the costs of commodities. In other words, different prices and different costs are what is experienced and cost (rather than the market) is discerned as the feature of goods and services, which varies with price. The understanding of price expressed in outcome A is linked with experience of variation in the markets for commodities. In this case, different prices are experienced in relation to differences in the characteristics of the markets involved and markets (in which costs, through supply, are integrated) are discerned as the source of variation in price.

Following the above line of reasoning, and in order to help learners to develop the desired conception, such as Outcome A, and widen their understanding of price it is important for teachers to provide learners with experience of variation in the markets for goods and services (Wood, 2002). In this case, understanding price in an 'A' way rather than a 'B' way requires a change in focal awareness.

Marton and Booth (1997:) are of the opinion that the differences in ways of experiencing or understanding price can be explained in terms of the different aspects of the phenomenon as experienced that are simultaneously discerned in the focal awareness of the learner. The aspects made to be present in awareness through teaching or the reading of text determines the object of learning. Thomas and Wood (1997) tried to account for and develop a certain way of experiencing by focusing on the experience of variation in the various aspects of an economic concept, which is along the same lines as the theory of variation advanced by Marton and Booth (1997). Wood (2002) argues that textbook material

must be presented in such a way that the critical aspect is fore-grounded for the student.

2.4.5 Rovio-Johansson (1999) Study on constituting different meanings of the content of learning and teaching in Management Accounting

A phenomenographic approach was used in this study. The purpose of the study was threefold; firstly, the study investigated teachers' different ways of presenting, handling and varying a subject matter during lectures; secondly to study the learners' different ways of experiencing and apprehending the subject matter content in higher education and lastly to investigate the possibility of developing a model for observing, describing and analysing teaching from a theoretical learning experience (Rovio-Johansson, 1999). The study was done with students at the Department of Management Accounting, at Göteborg University, Sweden.

The study involved fifteen first year university learners in Management Accounting, as well as three teachers each handling three consecutive lectures. The learners participating in the study were made aware of the different aspects of the subject matter, namely accounting. All the three lectures per teacher were video taped (18 hours). Five learners from each of the lecture groups were interviewed after each lecture, lasting 45 to 90 minutes. During the interview the learners were asked to solve a problem, which was related to the previous lecture's subject matter. The interviews were audio recorded and transcribed verbatim.

A phenomenographic approach was used when the transcribed lectures and the transcribed student interviews were analysed. The lectures were analysed from the first order perspective and the interviews from a second order perspective (Marton and Booth, 1997). In justifying the basis for a phenomenographic approach in his research, Rovio-Johansson (1999), agrees with Bowden and Marton (1998) as well as Marton and Booth (1997), that the fundamental research questions concerned variation, "a way of experiencing something", which has been posited to be related to how a person's awareness is structured. The experience as such contains both a "what" (object) aspect and a "how" (act) aspect related to the phenomenon. In researching experiences the focal awareness (the totality of our experiences) is important and a prerequisite for anyone to be able to experience the variation of different aspects of an object (phenomenon).

According to Rovio-Johansson, (1999), during a lecture the teachers presented, handled, used and varied a specific subject matter. When the teachers were teaching, they would focus on a dimension of a concept (an object) and open it as a dimension of variation. Some dimensions were focused but not varied and they were called invariant aspects. When the teacher was explaining a concept he would in co-operation with the learners constitute a space of variation, which was most often called the teaching object: i.e. space of variation.

The learners were afforded different teaching objects to experience and accordingly they experienced different learning conditions. The learners' ways of experiencing and apprehending the subject matter were explored in the interviews with a focus on how they applied their knowledge in problem-solving processes. A theoretical learning perspective (learning

study) had been used in the analyses of the interviews. During the study, the lecture theme was 'standard costing and variance analysis' (Rovio-Johansson, 1999). All the teachers agreed to solve a specific problem during the lecture. In applying the variance analysis to this problem they demonstrated a technical solution of the problem-solving process.

The way in which the mathematical formulae were applied was invariant and independent of the teacher's estimation methods. The variation was brought into the estimations by different resources such as direct material, labour hours, variable and fixed overhead and production costs. This meant that the total variance for a production was broken down in order to estimate how much of the variance could be ascribed to the various resources. In all presentations, the teachers brought into the lecture's content the student's understanding as a focused invariant aspect (Rovio-Johansson, 1999).

Each of the teachers was moulding different teaching objects, which were expressed in dimensions of variations and focused invariant aspects. For example, both teachers A and C focused on "total variance of direct material" as a dimension of variation, but whereas teacher A focused on "total variance of direct material" by contrasting 'standard quantity *times* standard price *times* actual volume' and "*minus* actual quantity *times* actual price *times* actual volume", teacher C did it by contrasting "direct material and price" and "direct material and quantity". Teacher B however, used a slightly different estimation method and the "total variance of direct material" was estimated by adding the quantity and the price variances (Rovio-Johansson, 1999:12). The teachers got the same figures as answers to this problem and they all produced a correct solution. According to

Rovio-Johansson, (1999:14) "the teachers' different ways of presenting and handling variance analyses constitute various learning conditions".

The learners' problem was similar to the problem used by the teachers in the lectures; however the learners' examples were limited to only one part of the variance analysis, the quantity variance of direct material. The learners' solutions were briefly described in dimensions of variation and in focused invariant aspects. For example, three learners out of fifteen solved the third interview problem correctly, one in group B and two in group C. The learners from group B used formulas introduced by the teacher during the lecture and to facilitate the learners' way of handling the quantity variance for direct material figures in the problem were expressed in words. The teacher had also demonstrated and varied both cost and quantity of direct material, when she compared the estimate and the actual cost. The student had discerned the dimensions of variation and these were critical dimensions, splitting the total variance into quantity variance and the price variance. He demonstrated by adding the quantity and the price variance and got a sum equal to the total variance for direct material. He checked his calculation. The same went for the student, number S12 who also got her solution correct. The three learners who solved the problem had discerned the critical dimensions of variation, which had been varied by their teachers during the lecture, when the teachers were demonstrating the estimation of quantity variance.

According to Rovio-Johansson (1999:18),

> ...the learners who managed to solve the problem, have experienced and discerned the critical dimensions of variation

during their lectures and that they constitute a learning object grounded in the lecture's content.

From his study, Rovio-Johansson developed a model for describing and analysing teaching different subject domains as follows:

> ...1) focus on an object and its content; 2) a specific dimension of variation of the object is focused by the teacher, opened and varied by contrasting, thematising or problematising specific parts of the subject matter; 3) elucidate the figure ground relation; 4) make clear the dimensions of variation and focused invariant aspects of the object which constitute the space of variation, i.e. the teaching object (1999:18).

In conclusion Rovio-Johansson (1999), suggested that teachers' ways of teaching, teaching skills and 'being good at teaching' are concerned with how the teachers present, handle and vary the subject matter or content by constituting a teaching object whereby teachers and their learners create different learning conditions. He added that one learning context is better than another because it corresponds better to the learning outcomes of the learning area. Consequently, the criteria of the learning outcomes for courses have to be designed during the planning phase of the course, followed up during implementation and finally settled for the criteria after evaluation. Furthermore, the criteria for the learning area outcomes have to be worked out to ensure the progression in the content area; i.e. the 'knowing how', the knowledge of rules, norms and of practice and how to solve the actual problem (Bruner 1990, 1996). If Rovio-Johansson's ideas were to be linked to the South Africa Outcome-Based Education, it implies that teachers or educators have to understand thoroughly the individual learning area outcomes, especially in EMS. This study attempted to

establish how teachers could discern the critical areas within the learning area outcomes in order to facilitate effective learning.

2.4.6 Pang and Marton (2003) Study on Beyond "lesson study": Comparing two ways of facilitating the grasp of some economic concepts

This study was conducted in Hong Kong, whereby 356 secondary school economics learners in the age range of 16-18 years were the participants. The participants were divided into two groups each with five economics teachers who also participated in the study. One group followed the Japanese *lessons study* model. The second group followed the *learning study* model.

The researcher in this case was Ming Fai Pang (a lecturer with the University of Hong Kong) and the study was completed in 2002. The main economic concept used in the study was the distribution of tax burden between buyers and sellers originating from a sales tax [which is known as value added tax (VAT) in South Africa]. When a Government levies a sales tax on goods and services, it means that a certain percentage of our purchase is paid to the Government. Most people believe that if this kind of tax is levied, the sellers will transfer the entire tax burden to the buyers simply by raising the price of the commodities by the amount of sales tax. Economists however believe contrary, arguing that, instead of making the buyers shoulder the full burden in every instance, the distribution of the tax burden on a particular commodity depends on the relative elasticity of demand and supply of the commodity.

The aim of the study was to develop the capability of learners to take into account the notion of the relative elasticity of demand and supply in determining the distribution of the tax burden between buyers and sellers (the object of learning), (Pang and Marton, 2003:15):

> ...the specific aim and measurable aim was to develop a qualitative understanding and also the skills to handle the problem and to show the reporting terms of qualitative relationships by graphs.

In justifying the use of this particular economic concept for this study, Pang and Marton (2003), argue that, the concept includes some of the most difficult concepts for school children at this level, and secondly, it was considered to be worthwhile for the learners to learn because it is a widespread economic phenomenon, as over 150 countries in the world have introduced a sales tax or VAT, (ibid). Similar reasons have been given to the current study.

During the study, teachers in one group called 'the lesson study group' developed a joint lesson plan for a series of four lessons, which were then executed in the five different classrooms. All of the lessons were videotaped and subsequently analysed in terms of the enacted objects of learning (Pang and Marton, 2003). After series of lessons, the learners' understanding of incidence of sales tax was investigated. All learners were required to finish a written task and five learners were chosen randomly for interviews. Based on the data obtained on teaching and learning, inter-group and inter-class comparisons were conducted to explore qualitative differences in the ways that teachers handled the same object of learning

and in the learners' qualitatively different ways of making sense of the phenomenon in question (ibid).

The second group referred to as 'the learning study group' adopted same procedure as the first, except that in this group the researcher participated in the, discussion and introduced the theory of variation as a tool for developing a lesson plan.

The crucial difference between lesson study and learning study groups was to require teachers in the latter group to base their ideas and action on a specific theory, viz. the variation theory. Answers from 158 learners were analysed with the aim of revealing the qualitatively different ways in which the learners made sense of tax incidence. The variation in experiencing the phenomenon was characterised in terms of 'categories of description', and an "outcome space" of the phenomenon in question was derived.

The following categories were found to capture the variation in the learners' ways of reasoning about what would happen if sales tax were introduced in Hong Kong (Pang and Marton 2003:18)

Sales tax would be:

A - put on the top of the price due to the market power of the sellers (those who sell things can get away with it)

B - put on the top of the price due to the inelastic demand (buyers need the things they want to buy so much that the sellers can just add the tax to the price)

C - shared due to elastic demand (if the burden is not shared the buyers would be less keen on buying)

D - shared due to elastic supply (the sellers can cut back on the supply)

E - shared due to elastic demand *and* supply (the distribution depends on the relative bargaining power of sellers and buyers).

The above set of categories depicts the differing meanings of the tax incidence among the learners participating in the study. Further analysis into the structure of these responses revealed the "critical features" their conception as follows:

A - demand elasticity – lack of (implicit)

B - demand elasticity – lack of (explicit)

C - variably elastic supply

D - variably elastic demand and supply

The main difference between category A and B is that the elasticity of demand (or rather the lack of it) is explicitly focused on in category B but

not A. The main difference between category C and B is that the demand elasticity does not have a fixed value, but might vary (across goods and time). In category D, unlike all the previous categories, the variable elasticity of supply is the focus. And in category E the learners could choose *simultaneous* variation in both demand and supply elasticity. To enhance the understanding of category E conception would require the study to make it possible for the learners to discern and simultaneously focus on demand and supply elasticity (Pang and Marton, 2003).

During the lesson presentations, the following questions were the focus of discussions between the teachers and the researchers on how to achieve the object of learning more effectively:

- How did you handle the same object of learning in the past?
- What were the difficult points of teaching the notion of tax incidence?
- Which way expressed by the participants did you think was better?
- How did learners make sense of tax incidence?
- How could we make learners develop a new way of seeing the notion of tax incidence? (Pang and Marton, 2003:21).

Data analysis focused on teaching and learning. The main focus of the analysis of the classroom data was on what features of the object of learning varied, varied simultaneously, or remained invariant. The analysis of the teaching data was supplemented by other sources of data such as those from the preparatory meetings, the interviews with the teachers, the lesson plans submitted, and the fields noted made. According to Pang and

Marton, (2003), the results of the study provided answers to three questions:

a) What happened in the different classroom? (What was the enacted object of learning like?)

b) What did the learners learn? (What was the lived object of learning like?)

c) What was the relationship between the enacted object and the lived object of learning?

In the *enacted object of learning*, all teachers had made systematic use of variation in demand elasticity while keeping supply elasticity invariant and in supply elasticity while keeping demand elasticity invariant. "This was thus a sequential pattern of variation, with two critical features of the desired understanding of the tax incident being varied one at a time, sequentially", (Pang and Marton, (2003:23).

The difference in the enacted object of learning between the two groups was in respect of *simultaneous* variation in demand and supply elasticity and invariance in the good used as example. The teachers in the learning study group introduced variation in both respects *simultaneously* unlike the lesson study group.

In response to third question of the *relationship between enacted and the lived object of learning*, the study showed that while over 70% of the learners in the learning study group developed a powerful understanding of

the tax incidence, fewer than 30% did so in the lesson study group, one ascribed reason could be that no teachers in the lesson study group tried to keep the commodity constant when dealing with demand and supply.

Besides, the study found that classroom activities differed systematically between the two groups in as far as the simultaneity of variation in demand and supply elasticity was concerned (Pang and Marton, 2003). The study concluded therefore that the variation theory contributed to enhancing learners' understanding by efficiently using variation in a specific phenomenon and focusing learners' attention on critical and varying features. In addition, experiencing simultaneous variation in demand and supply elasticity on the same invariant commodity, helped learners understand tax incidence better. Lastly and as mentioned earlier, teaching based on theory which is engaged to sensitising learners to variation helped them to focus on critical and varying features and supposedly prepared them to deal better with novel situations to which the actual economic concepts are relevant (Pang and Marton, 2003). The current study attempted to use the theory of variation to improve learning among EMS learners in South Africa, with specific reference to the Rand price determination on the foreign exchange market.

2.4.7 Perspectives on Economic and Management Sciences (EMS) Education in South Africa

2.4.7.1 Educational dispensation prior to 1994

In South Africa, the Nationalist Party came to power in 1948. When the Government felt the need for educational change in 1954, the Bantu

Educational Act came into being. This Act was meant to provide education based on racial lines, with the black majority receiving the least educational opportunities (SEASA News, 1994).

Jansen (1992:333) puts it succinctly that "curricular and instructional decisions are entirely outside the control of the teacher and students and placed in the hands of departmental bureaucrats and Government officials". Since the minister of National Education virtually controlled the educational funds for these 'States Departments' one was left to speculate on the amount of power the National Education Minister wielded. The South African education system had been segregated according to ethnicity and the apartheid policy.

Non-racial initiatives, however, occurred in private fee-paying schools. There was compulsory schooling after the age of six only for White, Coloured and Indian ethnic groups. There was no such compulsory education for the Black majority. For all South Africans, however, children entered formal schooling at the age of six and finished after 12 years (at the age of 17). The nature of the school system therefore was mainly elitist intended to perpetuate the political, socio-economic order of the status quo (de Vries and Smith, 1993). This meant that curriculum development was politically directed and handed down to teachers for implementation without deviation.

The South African education system provided for 18 separate Departments of Education, each system acting as a separate examination body (Lotter, 1994). Each department however adhered to the same core syllabuses. This arrangement has changed under the current Government. A new

apartheid syllabus for the 15-to-17-year old students. For instance, the 15-year-old (1983-1998) grade 8 syllabus is full of uninteresting conceptual clarifications, basic principles and relatively unimportant topics. The 21-year-old (1983-2004) matric syllabus is also too extensive to allow for any experimentation of any teaching methods except for the "talk and chalk" method (Paxton 1987:18) to push students through the final matric examinations. Thus the structure of most of the high school syllabuses could be described as an ideology or indoctrination, which presents topics to be 'crammed' without question (Thomas and Link 1985).

The syllabus is therefore not 'user friendly' to most African students, hence they do not generate much interest among schools. According to Levin (1989:3), the economics syllabus for the 15-to-17 year olds "consists of a number of loose individual topics randomly selected for inclusion." The listing of the subject matter lacks any logical and systematic presentation and is very unhelpful to teachers and students. Much emphasis on the syllabuses for 15-to-17-year old is on factual memorisation rather than the understanding of forces, developments, interactions, conflicts, changes and trends. The previous situation of economics education in schools was such that any promotion of the objectives was highly unlikely.

Thomas and Link (1985) portrayed a vivid picture of the situation when they said that there was nothing anywhere in the economics curriculum that encouraged students to critically investigate economic reality around themselves in the sharp contrasts of the South African dual economic and social system, namely, rich/poor, rural/urban, employed/unemployed, labour/employer, profit/environment, and owner/renter.

A newspaper report (The Citizen, May 1994) quoted one university lecturer in South Africa who described the education system in South Africa as being functional without any room for creative analysis. He was speaking on behalf of students at Vista University who had embarked on a strike action to protest against the kind of education they were receiving. Curtis (1988:14) explained the reason for the education situation by saying that "the effective disposition for critical and creative thinking presupposes a state of mind free of the fear of causing offence to the officialdom of a bureaucratic system". Parents, teachers, pupils and other stakeholders of Black education in South Africa belief that the syllabus (Thomas and Link, 1985) did not assist students in any form to understand day-to-day economic reporting in newspapers, financial journals and other sources. In addition the curriculum did not attempt to link the content of the syllabus with the real life economic situation as reflected in the media either through printed words, statistical data or verbal articulation. It is widely believed that economics education should place more emphasis on *learning* and not merely acquisition of knowledge and how this knowledge is reproduced.

The examination system (Lotter, 1994) ensured that this trend in the EMS curriculum was perpetuated continuously. For example, many issues raised in the standard 10 syllabus such as Government policy on decentralisation (which involved erecting of border industries, urbanisation and influx controls and many more), were largely uncritical. Also, the economic position of South Africa as higher-level 'semi-developed' or middle-income country was nowhere clarified in the syllabus and neither were relevant parallels drawn to other semi-developed countries.

According to Thomas and Link, (ibid) besides, the position of South Africa as a dualistic economy was not clarified and in-schools everywhere, South African disadvantaged poor communities were being made to perceive themselves as part of a developed South Africa. In schools, White pupils were encouraged to perceive their country as first world looking down on the disadvantaged Black sector as un(der)developed. The EMS curriculum was structured such that the capitalist 'free market' approach was generally taken as the only basis for the South African economy. This lack of other perspectives created a vacuum, which was filled by incomplete information on other alternatives. This was more in evidence during the first South African democratic elections, when some leading political parties who rejected the capitalist-based apartheid economy in favour of other alternatives, were able to attract more followers.

Furthermore, the majority of South African society could not identify with the apartheid EMS curriculum. For example, no mention was made of the kind of economic activities that existed prior to 1652 when the Europeans arrived in South Africa. To the African student, the impression was thus created that black history, be it economic, political or social was unimportant. "..in the formal school situation Africans were a forgotten factor" (Manyane 1989:24). The rejection of education under apartheid partly had resulted from this neglect.

The new EMS curriculum took a serious look at the aspect of African economic history. Specifically, the section on economic history relating to the status of the African or indigenous economic activity in the pre-European era in South Africa had been incorporated in the curriculum statement (Department of Education, 1997 and 2002).

For many years, i.e. about 10 to 15 years or more, the instructional texts for EMS curriculum had been dominated by same set of authors, for example, Stassen and Swanepoel. All schools in South Africa used this textbook, which had been written for the 15 to 17 year old students (Assan, 1995).

Quite recently however a few more EMS textbooks for these age groups have appeared on the market but most schools teaching grades 10 -12, between 1980 and 1996 still remain loyal to Stassen and Swanepoel, mainly because the external examiners for economics still require students to reproduce facts as they are portrayed in the book. Thomas and Link (1985:13) were of the opinion that, the prescribed economics textbook(s) for schools contained a myriad of objectionable points. Furthermore, these instructional books were less imaginative, more formalistic, less critical or more supportive of the white-centred status quo and more in need of supplementary supportive instructional material.

Many writers, Thomas and Link (1985), Paxton (1987a), Levin (1989b), Rantenbach (1992), to cite a few, unanimously recognised that the prescribed texts for school EMS were not user friendly at all. For example, the text for the 15-year-old economics students (grade 8 and 9), which was supposed to be an introduction to the subject, has chapters containing mere definitions, 'dry facts', abstract relationships and "not even a glimpse of the real life bustle of the economic life" of the child's life world (Thomas and Link 1985:13). EMS curriculum was therefore not given an analytical treatment in most South African school textbooks and to use Culyer's (1985:16) phrase, "most textbooks take the descriptive route..., and lack

an empirical approach". Hence these books did not go beyond mere knowledge of facts to bring home understanding of the information.

Levin (1989a) said the school textbooks were written strictly to satisfy the requirements of the school syllabus hence, like the syllabus itself, they exposed readers to only limited economic logic and even less to different economic paradigms. It is no surprise in the writer's own experience that most students were driven away during their first contact with the curriculum. The instructional materials at hand did not create a meaningful experience for the teachers to be able to facilitate the required learning experience among their learners. There is no doubt in the minds of many that a need exists for a whole new type of school EMS instructional material in line with a new curriculum statement for grades 1 to 12.

Using the phenomenographic research a new way of creating meaning among learners could be established through instructional texts and teaching, within the OBE approach.

2.4.7.1.1.2 Learning and Teaching EMS in South Africa

Thomas and Link (1985) described the school system in South Africa as full of authoritarian structures with total lack of participation of students in the teaching and learning process. Besides, there was lack of exposure to other views and experiences. For instance, South Africa under the apartheid system purported to be operating a free market mixed economy system.

Nevertheless, this kind of the economic system was distasteful because it was not a democratic one and many people were literally excluded from

participation only on the basis of the colour of their skin. Many people perceived the school system as an extension of the apartheid system, which had generated quite a considerable dissatisfaction among many stakeholders in education, such as the parents, politicians, teachers and, economists (de Vries, 1993).

The school structure did not allow (Paxton, 1987a and Levin, 1989b) teachers to 'see through'; the syllabus and go beyond being bound to the text-book, bound and also separated the subject from reality. For example, the teaching and assessment styles did not encourage teachers to bring life to the subject by means of relevant economic and business information from newspapers, magazines, journals, television and examples of entrepreneurial practices.

Rantenbach (1992) described the school system as heavily reliant on rote learning where during examinations pupils were expected to regurgitate what they had been taught without understanding the material. According to Kraak (1991), a survey among South African employers indicated many educational deficiencies among its employees, which could be traced to the type of educational provision. These included among others, the absence of thinking skills, self-discipline and productivity awareness.

The Commonwealth Secretariat summed up the educational situation in South Africa when it reported (1991) that teacher-training facilities were poor and this resulted in a poor standard of teaching. Most teachers were therefore underqualified, and also badly paid.

Besides the above, the nature of the examination questions did not motivate EMS teachers to make use of the wealth of illustrative material available everyday and week in the media, unlike UK and US. Teachers were not attracted to incorporate this wealth of information in their classroom activities (Paxton, 1991b, Thomas and Link, 1985). The nature the mixed economy that many South Africans are presently advocating under the new democratic Government would hopefully usher-in an education system based on a critical thinking curriculum. When outcome-based education (OBE) was introduced in 1996 and implemented in 1998, the demand for a new approach to learning and teaching had already been felt. This research is an attempt to contribute toward the search for a 'new way of experiencing learning and teaching' within OBE.

As Whitehead (1988b) pointed out, students live in a society, which exhibits less consensus on values and they are, not so complacent in tolerating a curriculum whose applicability they doubt. The school system is a melting pot for conflicting moral standards and conflicting cultures. The notion of authority is challenged and students demand more justification for what they do. The introduction of variation in teaching and learning through the learning study approach would add to the repertoire of teachers' skills in facilitating the acquisition of knowledge skills and attitude. This would help to advance the goals of OBE.

2.4.7.1.1.3 Assessment

The South African formal assessment system provided for 12 years of schooling (Lotter, 1994). The examination system had been organised on

racial lines. Before 1996 there were different public examinations for each ethnic group, operating under different examination departments.

Before 1996 students were normally assessed at the age of 17 years by one of the eight public assessment systems administered by the different examination department, with the DET acting as assessment body for about 10 Departments of Education, mainly for Black homelands. The Joint Matriculation Board (JMB) however, used to moderate and grant exemption to the Senior Certificate examinations of these departments until 1990 when this function was vested in SACERT (Bredenkamp, 1993). JMB, now called the Independent Examination Board (IEB) functioned as merely one of the many examination bodies in South Africa and it was mainly responsible for the private, independent schools or institutions. The Government, however, encourages all institutions to follow its current assessment guidelines. There was differentiation in the examination modes and content by each department. Malherbe, (in: Curtis, 1988) explained that this was introduced in 1975 to allow for mixed ability group a "differentiated" assessment to distinguish matriculants from school leavers for the purposes of certification.

According to Levin (1991), higher-grade instruction demanded a more analytic-theoretical descriptive approach, whereas the standard grade mainly lent itself to descriptive approach. Thus questions were set for both grades on same topics or concepts but differed in their degree of difficulty. By this arrangement, candidates were examined on either the 'standard' or 'higher' grade in many subjects including those of EMS. The practical problem of differentiated teaching in this arrangement was that, in the majority of schools, the two groups were put together in the same

classroom and both students received the same instructional approaches and materials resources. It was only during the assessment process that students were advised to sit for a particular grade. Most of the lower ability students by this time had already lost interest in the subject because of being treated at the higher-grade level of subject difficulty with the rest of the class.

According to Malherbe, (ibid) prospective matriculants were expected to pass five subjects at least from different groups, A to F, with one compulsory subject from group A (which comprised the present 11 official languages of South Africa). Three out of five subjects must be passed on higher grade level if a student intended to matriculate i.e. gain a university entrance), otherwise the candidate was awarded a school leaving certificate.

Many people, especially teachers, believed that the nature of the public examinations was contrary in many respect to what were considered to be the proper aims of education (Curtis, 1988 and Levin, 1989b). Bloom (in: Hamilton 1976) were of the opinion that education generally should be geared to producing people who can deal with words, concepts and mathematical symbols so necessary for success in the present technological society.

Examinations influence the nature of the curriculum because they can help in the achievement of desirable educational objectives (Curtis, 1988) and in apartheid South Africa it coerced teachers into educationally inappropriate actions of social control in line with the apartheid system.

It also encouraged teachers to prepare their students for the techniques of the public examination, contrary to the aims of education, by encouraging memorisation of facts instead of using these facts to interpret and analyse (Levin 1989). Most South African public examiners, like their UK counterparts, award marks to candidates according to the level of skill of the candidate (Jordaan, 1992). But whereas some UK examiners will rank the mere exhibition of 'acquisition of knowledge' as the lowest skill level and thereby earn the least marks (25% or less of total marks), (Williams, 1994), their South African counterparts rank 'acquisition of knowledge' as the highest order of skill and thereby award most marks (75% or more of total marks).

The implication is that most South African teachers lay more emphasis on EMS knowledge as the 'truth' to be memorised with little room for evaluating the knowledge. On the other hand, most UK examiners award up to 80% or more of the total marks to analysis and evaluation compared with 20% or less by South Africa on similar assessment practices (William, 1994). Mostert and Halton (1993) say that this trend by South African examiners or educational authorities had been perpetuated under the often-erroneous belief that more content is better. Hence students were burdened by more lecture commitment rather than by developing the desired thinking skills which resort to 'spotting' and memorisation. Furthermore, the nature of the school system had not allowed the majority of the students to develop the abstract cognitive structures which were presupposed for EMS education.

Most students have not had the ability to mobilise higher-order skills of thinking as a result of the content-based rote-learning context in which

their learning has been rooted (Mostert and Halton, 1993). Despite changes in mode and style of assessment in education, the modes of economics questions, for example, used in 1948 and 1949, still prevailed within some examination bodies in South Africa, according to Levin (1989). These examination questions therefore require irrelevant knowledge from the pupils in addition to the fact that they were wrongly and badly framed. According to Juwitz (in: Lotter, 1994) except for JMB and the Indian education department, most of the departments, which conducted public examination in South Africa, produced candidates poorly equipped for university studies.

Despite the fact that a core curriculum was used by all the various departments and that questions set by the various departments might, on face value, be of the same standard, according to Bredenkamp (1993) there were severe deviations in the standards of marking the answer scripts. The worst result came from DET. The studies also indicated that the matric symbols were a less accurate predictor for success in university for students examined by black education departments.

These studies pointed to the need to reform the South African school curriculum more especially with regard to EMS education. Hence the introduction of OBE in the primary and secondary schools in 1997, and 2002 in the high schools respectively, with the focus more on specific and critical outcomes (Department of Education, 1997 and 2002). With the introduction of National Curriculum Statements (2002) only 35 subjects, without differentiation as described above, have been approved for FET.

Another aspect, which the assessment system failed to incorporate, was the affective considerations which, according to Curtis (1988) were relevant to EMS in the wider context of the curriculum. Economics definition includes the normative function and the assessment system should include "both the cognitive and the affective domains" (Assan, 1995:85)

In the next section we examine the nature of teacher education in South Africa and how this impinged upon learning, teaching and assessment.

2.4.7.1.1.4 Teacher Training for EMS Teachers

According to Badenhorst (1992) one most salient inequality that impacted negatively on the state of black education during apartheid was the qualification of teachers. A study up to 1993 (Taylor, 1994) showed that almost 50% of the teaching stock was unqualified or under-qualified, and that qualified teachers were inequitably distributed across South Africa. There was an oversupply of teachers in most urban areas and an under-supply in rural areas. At the same time, there was a general shortage of teachers in mathematics, science, English, technical and vocational subjects, including EMS.

Two main types of teacher training programmes for secondary school EMS could be identified in South Africa. These were the pre-service and the in-service teacher training. The universities did not however play any significant role especially for the black matriculants, in both pre-service and in-service education until 1996 when by legislation, pre-service teacher education, became the domain of Higher Education Institutions.

Most pre-service teacher training structures were undertaken under the Department of Education and Training (DET) and the Transkei, Venda, Bophuthatswana and Ciskei (TVBC) states which provided the logistic support including certification.

Nevertheless, some universities in South Africa offered a postgraduate education diploma. The teacher training institutions in the former Bophuthatswana now part of North West Province of South Africa, were affiliated to the University of Bophuthatswana, later known as University of North West but now a merged institution with Potchefstroom University, known as North West University. The university provided academic support and certification. Students in the University of Bophuthatswana, for instance were enrolled, in the Faculty of Commerce and Administration and received certain education courses in the Faculty of Education – for B Com (Ed) degree.

Less emphasis was however placed on the subject methodology and students spent less than 10 weeks on practice teaching during the four-year training. Assessment of practice teaching was done by the school concerned, the University and the Colleges provided assessment moderation. In most cases lecturers with no secondary school teaching background, nor any grounding in subject methodology knowledge provided external teaching practice evaluation.

Studies by Taylor (1994:6) indicated that the South African teacher education system contained "fragmented, inefficient and grossly disparate institutions". Also, most colleges fell under the strict control of the various Education Departments. According to Taylor (ibid), in many cases the

goals, values and curricula of teacher education were inappropriate and inhibited creative and flexible practices. As mentioned earlier on, pre-service teacher education is now reserved for Higher Education Institutions. There is therefore no doubt that innovative models for learning and teaching would be required to carry forward the aims of OBE. Hence this research was an attempt to undertake a learning study, which would contribute to an effective way of teaching and learning in EMS.

Thomas and Link (1985) established in their studies that by 1985 there was only one didactics source or text of South African origin for EMS teacher education programme. By 1994 however, one more text on didactics, by Paxton and others of South African origin, was also available. The Journal of the Society of Economic Science Teachers also features some articles on subject methodology to supplement the available resource materials. This current stock of instructional materials is not sufficient to pursue the goals of OBE. Even though according to Taylor (1994), South Africa has a large in-service training programme for teachers, with millions of Rands spent by both private and foreign donors in an attempt to improve the quality of teaching, there is no concrete programme in South Africa specifically for in-service training of EMS teachers.

Most INSET courses have concentrated on Maths, Science and English. Nevertheless, the inset courses to date have not achieved anywhere near their potential impact because of a "lack of a systematic link between INSET programmes and the classrooms and lecture halls in which their lessons are to be implemented", (Taylor, 1994:8) among other things. Thomas and Link (1985) believed that absence of INSET for EMS teachers meant that teachers would only ever have access to a formal style of

teaching which was geared far more towards perpetuating the discredited status quo. Many teachers are themselves victims of rote learning and this perpetuates a vicious circle of under-development (Rantenbach, 1992).

Beside the upgrading programmes to improve the academic and professional skills of EMS teachers, in-service education was also needed to redirect teachers' perspectives from the shortcomings of the apartheid educational provision. In other words, education could be treated as a dissemination of mere textbook knowledge. Manyane (1989:9) was of the opinion that such a form of education was purely content- based, which was characterised by "demand for recall and regurgitation of inert information" without any appropriate desire for critical thinking competence. The trend according to Whitehead (1988) was to adopt a curriculum which emphasized skill-based development and critical thinking.

There is no doubt that content from the discipline can provide a strong base for developing critical thought. At the same time, there is the need to move away from the old, knowledge-based curriculum. In other words content is to be treated as a means to an end and not merely an end in itself. The theory of variation can be one such principle to improve learning and teaching in this period of learning transformation. This research aims to do that by using learning study grounded in phenomenographic approach to explore qualitative improvement in learning outcomes.

2.4.7.2 Post Apartheid Economic and Management Sciences Education in South Africa

In outlining a new Policy Framework for Education (1995), the ANC envisaged that the New National Learning system will be "learner-centred and achievement led" (ANC, 1995:78). This vision culminated in the passing into law of the Schools Act of 1997 and the implementation of Outcome-Based Education in 1998, which was officially implemented in 1999 at grades 1, 4 and 7. In October 2002, The National Curriculum Statement for grades 10 –12 was launched for implementation from 2005 in grade 10. The new curriculum saw the reduction of the matric subjects from 134 to 35. Besides, the Higher and Standard Grade system for each subject under apartheid was abolished. The basis for the new curriculum was provided by the adoption of the Constitution of the Republic of South Africa (Act 108 of 1996). The Constitution among other provisions aims to 'heal the divisions of the past and establish a society based on democratic values, social justice and fundamental rights" (The Constitution, 1996:6). It further states, "Everyone has the right... to further education which the State, through reasonable measures, must make progressively available and accessible" (The Constitution, 1996:14). The National Curriculum Statement Grades 10-12 (schools) lays a foundation for the achievement of the aims by stipulating outcomes and standards, and by spelling out the key principles and values that underpin the curriculum (Department of Education, 2002).

The purpose of the EMS education, according to the Department of Education is to equip learners with knowledge, skills, values and attitudes that will enable them to participate in, contribute to, adapt to, and survive

in a complex economic society (Department of Education, 2002). Furthermore, it will enable them to demonstrate a critical awareness of the benefits of responsible and sensitive resource exploitation. This is different from that under the apartheid in the sense that apartheid education was based on the principle of separate development, unlike the current constitution of the country. In terms of the South African constitution, social transformation in education is aimed at ensuring that the educational imbalances of the past, as stated above, are addressed, and that equal educational opportunities are provided for all sections of our population.

2.4.7.2.1 Outcomes-Based Education (OBE)

The policy document (DoE, 1997:15) on Senior phase defines OBE as

> ...a learner-centred, results-oriented approach to education premised on the expectation that all learners can learn and succeed. It implies that learning institutions have the responsibility to optimise the conditions for success.

If social transformation is to be achieved, all South Africans have to be educationally affirmed through the recognition of their potential (Department of Education, 2002). OBE forms the foundation for the curriculum in South Africa. OBE strives to enable all learners to reach their maximum learning potential. The outcomes according to the Department of Education (2002) encourage a learner-centred and activity-based approach to education. By focusing on the critical and the developmental outcomes in EMS, as stipulated in the curriculum statements, this study on phenomenographic approach hopes to develop a way learners could create their own meaning as and when they

experience the concepts, (with specific reference to the foreign exchange market), through the variation theory in learning.

2.4.7.2.2 OBE Principles for EMS

According to the DoE (2002:4) OBE was adopted for the South African Education system due to the following:

- ...it sets clear outcomes for learners at each stage of their education so that everyone involved (learners themselves, teachers, parents, etc.) knows what is expected; this means that it becomes easy to measure a learner's progress against these outcomes
- ...it takes a broader view of a learner's development than previously; we are not just looking at the learner's development in terms of what they know (their knowledge) but also in terms of what they can do (their skills), and what they believe (their attitudes and values)
- ...learners can now play a much more active role in their own education than before.
- ...OBE emphasises how learners learn as well as what they learn; as their studying skills improve during their school education, it means that they are better equipped to carry on studying at tertiary institutions and during their working lives.
- It is an approach that can help remove the discrimination of the past, and prepare our children to function better in the South Africa of the 21st century when they leave school.

With these OBE principles, it was appropriate to integrate the phenomenographic approach (chapter 2) into the OBE classroom activities with the main purpose to facilitate and improve the quality of learning as discussed in this study.

2.4.7.2.3 OBE and Phenomenographic Approach

Section 4.3 discussed in detail the role of phenomenographic approach in education. From the discussion, phenomenography looks at mainly the "qualitative ways people experience learning". From the principles outlined above regarding OBE it is important that educators understand how people experience learning qualitatively so that the conditions for creating effective learning in OBE could be maximised to enhance effective learning. The results from this study, as demonstrated in chapter 4, shows that a phenomenographic approach could combine with OBE principles to enhance learning outcomes through the integration of the learning study principles used for this study, (outlined in chapter 3) within the variation theory of learning into the daily classroom activities. The phenomenographic approach therefore complements OBE principles.

2.4.8 Summary of the Phenomenographic Studies on Learners in EMS

The foregoing chapter has focused on the reviews of the phenomenography research studies on economic and management conceptualisations of students, particularly on economic conceptualisations. Undoubtedly, the existing literature in this phenomenographic perspective is limited at this stage but it is nevertheless growing. The first study by Dahlgren (1975) identified the various conceptions that university students held about the economic concepts contained in a textbook, and found that the level of outcome space was determined by the number of dimensions of variations being simultaneously focused on. Dahlgren's later studies (1978) were an extension of the study on economic conceptions from textual

comprehension to how students make sense of everyday economic phenomenon, and he attempted to evaluate the effectiveness of a university level introductory economics course. Using the data from the interview questions about everyday economic phenomenon, he managed to arrive at the different economic conceptions held by the learners, such as those of price, and concluded that the effects of the course on learners' conceptions were limited – learners merely produced superficial change by learning the technical jargon without any real transformation taking place in the conceptions that they held.

Dahlgren (1979) carried out a similar study on the conceptions of price held by nursery and primary school learners, and an outcome very similar to that of the university students in 1978 was obtained. A point of departure in this study was that the conceptions were found to be a function of the questions asked, and were very context-dependent, as many learners expressed different conceptions for different questions. The use of contextual variation was of limited transfer value, as while learners might have been able to produce the desired conception in response to one particular question, they were unable to transfer it to another new situation embedded in another question (Pang, 2002).

The main results of Dahlgren's three studies were the categories of description, and thus the outcome space, which is in line with the early development of phenomenography. However, the emphasis of these studies was still on the pure description of the qualitatively different ways of experiencing certain economic phenomena.

As a result of the "new' development in phenomenography, Thomas' studies used the phenomenographic approach to help classroom teachers improve their teaching and hence student learning. Thomas and Wood (1997) suggested that the research process should commence with identifying the qualitatively different ways of understanding the economic phenomenon in question, and then finding out the sources of variation in experience for students.

They argue that the emergence of different conceptions was due to different students attending to different aspects of the phenomenon which was linked with the experience of variation in different aspects.. This means that in helping learners to develop the desired conception, it was important for educators to expose the experience of variation in the relevant aspects of the phenomenon to be learnt.

They also tried to experience how a particular conception is formed and suggested ways to help learners to develop a certain way of experiencing economic phenomenon in an educational setting. This was in line with the theory of variation as developed by Marton and Booth (1997), and represented a good attempt to use the phenomenographic approach in promoting teaching and learning economics.

Rovio-Johansson's study (1999) was focused on firs-year economic and management sciences' students at university. Nevertheless the fact that they had just come from the school system makes it more relevant for this study. His study revealed that "teachers ways of teaching, teaching skills and 'being good at teaching' is concerned with how the teachers present, handle and vary the subject matter content", (1999:18). He emphasized

the importance of planning as a pre-requisite for successful teaching activity. His focus has therefore been on the learning conditions teachers constitute together with their learners and not on the personal abilities or teaching skills. Rovio-Johansson (ibid) study showed that by constituting a teaching object, teachers and learners create different learning conditions. In economic and management sciences content, students who managed to solve a particular problem have experienced and discerned the critical dimensions of variation during their lessons and that the students were able to constitute a learning object grounded in the lesson content.

The study by Pang and Marton, (2003) based on experimental phenomenography, attempted to explore the possibility of learning certain economic concepts where these concepts became the object of learning. The findings seemed to suggest that educators in the learning study that was premised on a specific theory of learning, in this case the theory of variation (the learning study group), was more effective than the lesson study model (the lesson study group), in which educators work together without an *explicit* theoretical point of departure. The study highlighted the impact of the theory of variation in improving economic understanding of economic concepts among learners. Any theory which aims at improving understanding of particular concepts, is welcome.

Finally, the perspective on South African education explores the extent to which EMS education has prevailed in the country during the pre and post apartheid periods. it is clear from the exposition that EMS has received a tremendous boost due to outcome-based education, which has ensured that EMS is taught throughout the country at least up to grade nine.

The approach to Outcome-Based Education, as mentioned earlier, lends itself to phenomenographic approach since it emphasises learner-centredness. This study therefore explored the ways to increase learner participation and understanding of EMS. It also provides a basis for improving teacher education in EMS in line with Outcome-Based Education goals. In order to obtain support for this proposition from empirical work, the present study uses the theory of variation to design instructions in Economic and Management Sciences lessons for secondary learners in grade nine in order to bring about learning, by helping the learners to develop certain ways of experiencing economic phenomenon. The design and methodology of the study is explained in the following chapter.

2.5 Conclusion

This chapter has examined extensively the nature of the literature in which this study is grounded. The chapter discussed the perspectives on knowing and the fundamental issues related to the phenomenographic approach. The outline of research studies relating to learning and teaching exemplify a selection of studies within the phenomenographic research tradition. The chapter also examines various phenomenographic studies on which this study was conceived and implemented. Even though all these examples relate to the European milieu, this research intention was to investigate how teachers' ways of teaching affected learning as specified in the purpose statement, within the context of phenomenography. The last section however examines in detail related research studies and literature on EMS education in South Africa in detail.

CHAPTER 3

RESEARCH DESIGN & METHODOLOGY

3.1 Introduction

This chapter focuses on the economic topic – *foreign exchange market*- used in the study and gives reasons for the choice. The introduction of the topic is followed by an outline of the design of the empirical study conducted, including the research method, the details of the participants, as well as the method of data collection and analysis. A summary concludes the chapter. The research method is based on the account of phenomenographic studies on learning in economic and management science, as well as the theoretical framework, both discussed in chapter two.

3.2 The Economic Concept Used in the Study

3.2.1 Justification for the Choice of the Concept

In South Africa a new education dispensation was introduced in 1998 which made the study of economic and management sciences mandatory for all learners from grade 4 to grade 9 as part of the eight learning areas as discussed in chapter 2. The reasons for making economic literacy compulsory for all senior phase learners have been mentioned in chapter 2, but suffice it to say that in 1999 in the world survey on economic literacy among some fifty leading nations, South Africa was ranked 49th and was judged to be an economically illiterate nation (United Nations Report, 2002). The fifth Developmental Outcome under the NCS (Department of Education, 2002) requires learners to develop entrepreneurial

opportunities. Besides, the need for citizens to understand Government economic policy and entrepreneurship is linked with political and economic stability of the nation.

The economic topic used in the present study is foreign exchange market, which comes from the South African Economic and Management Sciences (EMS) curriculum for intermediate and senior phases (grades 4 to 9). This topic was chosen for the following reasons.

Firstly, it includes some of the most difficult concepts for learners at these levels; nevertheless the concept appears in at least 4 out of the 7 Specific Outcomes (SOs). Under SO1, Assessment Criteria (AC) 4, Range Statement 4, learners are expected to demonstrate an understanding of the nature of and need for foreign exchange market as well as to show the relationship between supply and demand factors. Price/value determination is not a popular topic to deal with and feedback from educators indicates that learners at grade 9 have always had difficulty dealing with concepts under foreign exchange. This assertion results basically from formal and informal interactions and interviews the researcher has had with educators and learners in the field as well as the results from the grade 9 learners' assessment on learning outcomes. Even at the high school, questions pertaining to foreign exchange in economics have been poorly handled at the matric levels.

Secondly it was considered to be an important topic for the learners to learn because it is considered as the bedrock for employment and economic growth. Recent debates about growth and employment in South Africa led to the value of the Rand being singled out by Trade Unions,

Manufacturing and Mining Industries as the prime cause for slow growth and unemployment. These sections of the economy have strongly urged the Government, especially the Reserve Bank, even through strikes and marches, to deliberately *bring down the price* (depreciation) of the Rand in terms of other currencies as a means of increasing exports and thereby improving local employment and growth. The argument, which the Reserve Bank often puts up, is that the price of the Rand is the function of the foreign exchange market mechanism, which is mainly influenced by the market forces of supply and demand. For example, in his Governor's address, Mboweni (2004:8) among other things stated that "... the external value of the Rand is basically determined by supply and demand in the market for foreign currency". It was felt that if learners understand the topic the essence of it would be seen through how some aspects of the South African economy work, which influence their daily lives economically.

Thirdly, the topic had been taught already by the same educators just under four weeks before the pre-test and for the purposes of comparison it was agreed to use it for the pre-test. The pre-test results provided ammunition for further investigation using the phenomenographic metaphor. The topic also appears directly or indirectly in three other learning areas, specifically, in Human and Social Sciences, Technology and Life Skills, thereby making it an important topic which the degree of understanding and experiencing as discovered from the phenomenography research could provide a basis for curriculum innovation. The next section discusses the content of the economic topic chosen for the lessons in this study.

3.2.2 The Foreign Exchange Market

3.2.2.1 Introduction

The explanation of the concept for this study has been made simpler and uses the English language is in line with the age and grade level. The medium of instruction for EMS grade nine learners is currently English and not the learners' mother tongue. The language and the technicality of the subject have also been considered appropriately where necessary to convey the real meaning of the concept. This study was done with grade nine learners within the age group of 14 to 15 years as mentioned below. The researcher was also aware of the language barrier (medium of instruction) which both the educator and the learner face in the classroom, and considering the complexities of the subject and based also on the level at which text-books have been written in line with the OBE principles, the language and technical components have been restructured in certain cases to enhance the meaning to be conveyed using the variation theory of learning. Furthermore, due to the characteristics of the learners, and the resources available in the schools, the critical aspects of the learning object was the focus of the classroom activities to promote the objectives of the study.

3.2.2.2 *What is Foreign Exchange Market?*

Based on the common sense of understanding foreign exchange, when international trade takes place an exchange of currencies is necessary.

In practice, this work is performed by the banks and accredited dealers or agents on behalf of their customers. The foreign exchange market consists of most banks together with a small number of small firms who specialise as foreign exchange brokers or agents. There is no meeting place for the market since nearly all business is conducted over the Internet, telephone and telex. Banks and other agents throughout the world conduct business with each other in this way and the market is, therefore *international*. Through the foreign exchange market each currency acquires a value in terms of the other currencies for which it can be bought and sold.

3.2.2.3 What is Foreign Exchange Rate?

An *exchange rate* is the price of one currency in terms of another. It is determined mainly by the supply of, and demand for, the particular currency. Under the free market system, the price of a currency is determined by the forces of demand and supply. This is a system of free or floating exchange rate as operates in South Africa. According to Mboweni (2004), the external value of the Rand is basically determined by supply and demand in the market for foreign currency.

3.2.2.4 Which Factors determine Supply and Demand for Foreign Exchange?

The supply of Rands, for example, depends on the extent to which people, business establishments and Governments wish to sell Rand in exchange for other currencies. The sellers will include South African importers and investors in foreign firms. For example, South African businesses like the mines would like to buy mining equipment from Canada. Edgars will buy clothing from China. Old Mutual will also want to acquire shares in a

company in Sweden and MTN would like to buy into Nigerian and Portuguese Telecommunication companies.

On the other hand those who create demand for the Rand will include foreign importers and overseas investors in South African bonds and stocks and the shares of South African companies. For example, firms in the UK would buy shares on the Johannesburg stock exchange. Shop owners in Ghana and Angola will require the Rand in order to buy South African made goods for their shops and warehouses. At this stage therefore, the foreign exchange value of the South African currency, the Rand will be closely related to the balance between exports and imports. It will also be influenced by the capital transactions between South Africa and the rest of the world (Stanlake and Grant, 2001).

3.2.3 How is Rand price/value determined?

The Reserve Bank of South Africa has made it clear that the value or price of the South African Rand fluctuates in response to the free operation of the forces of supply and demand in the foreign exchange market, without any official interference (Mboweni, 2004). In this type of market the value or price of the Rand in terms of the Dollar, for example, would depend upon the demand for Rands from holders of the Dollar and the supply of Rands from holders of Rands who want to buy dollars (Stanlake and Grant, 2001). South African residents trying to buy foreign goods and services (imports) will be *supplying Rands* to the foreign exchange market (and demanding foreign currencies) while overseas residents wishing to buy South African goods and services (exports) will be *demanding* Rands (and supplying foreign currencies). There will be some equilibrium price (i.e.

exchange rate) which equates these two forces (supply and demand for Rand). Diagram 2a shows the equilibrium price of Rand in terms of US Dollars.

Diagram 2: <u>Rand Price/Value Determination at the Foreign Exchange Market</u>

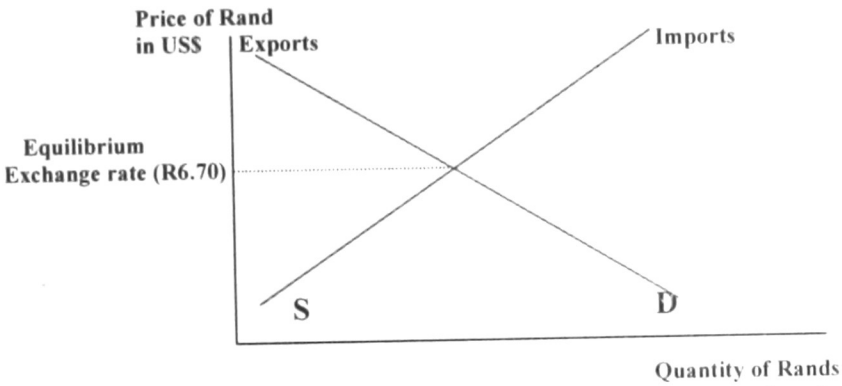


Diagram 2a: The Equilibrium price of Rands in terms of US Dollars (Exchange Rate).

<u>Key to Abbreviations in the Diagram</u>
DR is the demand for Rand
SR is supply for Rand
D$ is the demand for Dollars
S$ is the supply for Dollars
Q is quantity
P is price
E is equilibrium point

The intersection of the supply and demand curves gives the equilibrium exchange rate. At that rate the amount of currency that exporters demand is exactly equal to the amount that importers wish to supply. This rate is the *exchange rate* and it is the price or value of the Rand. The demand for and the supply of the Rand on the foreign exchange market determines the price or value of the Rand. Diagram 2a above shows this (Wall, 1994). In the longer term, exchange rates are influenced by trade flows, and short-term capital flows.

Supposing that many exporters (South African–based businesses) succeed in improving their non-price competitiveness. They improve quality, reliability and design of their products and services (Wall, 1994). This will entice more foreigners to buy their products and services and their prices will rise. This in turn will cause supply to extend as foreign exchange dealers will become more willing to sell currency at a higher price. The demand for the Rand with which to buy these goods will rise (that is shift to the right as shown in diagram 2c).

But things could also go the other way. If exports are not selling well, because too many of the relevant products and services fail to compete, for example with American products and services, the demand for the Rand to pay for exports will drop. It is likely however there will be a high level of demand for imports (supply of Rand). People will prefer foreign goods due to the inferior local goods and services or due to a surge in taste for foreign goods and services as compared to local goods (Wall, 1994). They will use the Rand to buy Dollars. The supply for the Rand coming from demand for imports will therefore be large (diagram 2b).

It is important to note that there is not just a single exchange rate for a currency. The Rand for example, can be valued in terms of most other currencies. For example, the Rand and United States Dollars, Rand and Euro, Rand and Sterling, Rand and Nigerian Naira. The demand for the Rand exists (in this example, in diagram 2 above and below) because of the Americans' desire to buy goods and services produced in South Africa. If this demand for South African made goods and services (exports) increases there is an increase in the supply of American Dollars onto the

FOREX market. At the same time the demand for the Rand by the Americans increases. This has two simultaneous effects.

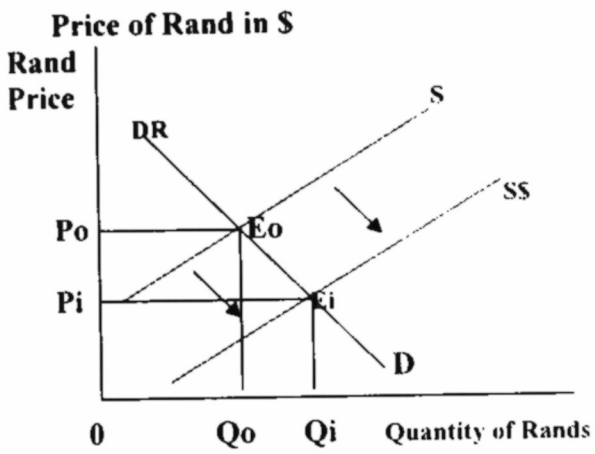


Diagram 2b: The Supply of Dollars

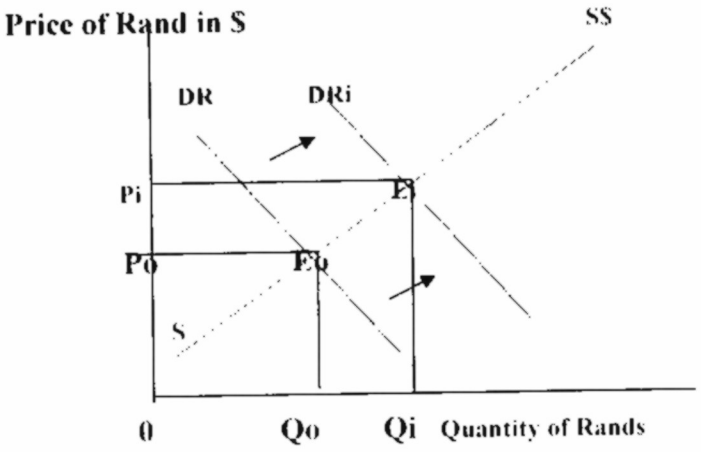


Diagram 2c: The Demand for the Rand

Diagram 2b shows that an increase in the supply of United States Dollars causes a parallel shift to the right in the whole supply curve. Thus, the equilibrium quantity of Dollars supplied rises from Qo to Qi but the price of Dollars in terms of Rand, that is the exchange rate, falls from Po to Pi. This means that the Dollar is now relatively cheaper in comparison to the Rand. It is possible to purchase more Dollars for a given quantity of Rand.

Diagram 2c shows that the simultaneous increase in the demand for Rand by the Americans results in a parallel shift to the right of the whole demand curve for Rand. Thus, the equilibrium quantity of Rand demanded rises from Qo to Qi, but the price of Rand in terms of Dollars, the exchange rate, rises from Po to Pi. The result of this is that Rand is now relatively more expensive in comparison to Dollars. This means that it now takes relatively less Dollars to purchase the original quantity of Rand.

3.3 The Research Methods

3.3.1 Design Experiment

To address the fundamental research questions mentioned in chapter 1, the practice of the learning study (Marton, 2001, Pang, 2002)) was adopted as the research method of this study. Learning study and the design experiment (Brown, 1992; Collins, 1992, 1999; Pang, 2002; Lewis, 2000; Lewis & Tsuchida, 1988; Stigler and Hiebert, 1999; Ma, 1999) including a justification for a case study design are discussed below:

According to Corte, Verschaffel and Van De Ven, (2001); Pang, (2002); Marton and Pang (2003) design experiment is theory-based and its results are systematically evaluated. It takes place in real classrooms in which it is difficult and perhaps impossible to control all the variables in order to allow one aspect of the learning environment to be examined independently of the whole system. The variables include the multi-faceted independent aspects such as learner characteristics, educators' professional development, curriculum design, assessment, motivational issues and computer technology. According to Brown, (1992) and Collins, (1992), despite the limitations with design experiments in education, it is worthwhile to use it in classroom research. The learning study approach was utilised in part to determine the nature of qualitative change in learning outcome. This study could be described as a quasi experiment due to the fact that the topic chosen had been taught to the learners by the same educators who participated in the study, during the usual school teaching programme. Since the participating learners had been taught the same topic about four weeks earlier, it was expected that these learners

already understood the concept. The pre-test was an entry point for the study and the results analysis showed that they had been taught. After the pre-test, the same educators integrated into their classroom activities a new learning strategy within the phenomenographic approach as discussed, to enhance the understanding of the same topic among the same learners as demonstrated by the post-test results (chapter 4).

3.3.2 Case Study

A case study method was also involved in which a particular group of learners were treated using a particular method, and evaluated over a period of time. A particular behaviour of a particular group of learners was studied in the form of a case study with a pre-test-post-test-retention design (Corte, Verschaffel and Van De Ven, 2001) to evaluate how learning was experienced by grade nine learners. These learners with their educators went through a series of classroom instructions based on learning study within the theory of variation. The educators who provided the kind of lessons based on the learning study have gone through a programme with the researcher during their study at the university. It was agreed that the learning study would be put into practice and these educators volunteered with their classrooms and learners for the purpose. The main purpose of the study was to identify ways of systematically strengthening classroom practices in order to make learning possible.

This study is described as a case study in the sense that the learners' experiences of a particular economic concept and the learning experiences that they encountered with the concept over a particular period of instructional time, using a different learning study approach were described

and evaluated. Blaxter, Hughes and Tight (2001) described a case study data as those drawn from people's experiences and practices as well as being used to illustrate problems or indicate good practices. Case study is therefore appropriate to explore alternative meanings and interpretations

The focus of this study was to identify varying learning experiences on how the determination of the Rand price was understood by the learners over a period of learning instructions. However within the phenomenological approach the learners' experiences of the concept were investigated and described. Information on these learning experiences was obtained through written tasks and interviews as described in chapter 4. Both qualitative and quantitative approaches within the pre-test-post-test-retention design formed the basis for the analysis.

The use of pre-test-post-test-retention design for this study was to provide the basis on which the learners' experiences could be systematically evaluated into categories of conceptions within the outcome space and also within the phenomenographic approach (Corte, Verschaffel and Van De Ven, (2001); Pang, 2002).

3.3.3. The Learning Study Approach

According to Pong (1999) and Pang (2002), the 'learning study' approach has two aims; firstly, to build innovative learning environments and to conduct research studies of theoretically grounded innovations. Secondly, to pool teachers' valuable experiences in one or a series of research lessons to improve teaching and learning. In fact the primary focus is however on an object of learning, not on teaching methods.

A learning study entails five steps (Marton, 2001):

i. The first step involves choosing the object of learning that is, starting from an object of learning and not teaching arrangements or methods. The latter are the means which are used to achieve the ends represented by the object of learning. The object of learning can be a capability or a value to be developed during a single lesson or over a longer period of time.

Examples of a *capability* or *value* include understanding the concept of foreign exchange market, inflation, proficiency at phonics, and developing empathy with people from other African cultures. The initial characterisation of the object of learning and the attempt to achieve it should be grounded in theory. In this research 'foreign exchange market and specifically the Rand price determination on the foreign exchange market' was chosen as the object of learning and this was grounded in the theory of variation.

ii. Step two entails ascertaining learners' existing understandings, by an analysis of learners' conceptions through a pre-test on their capability. This helps in the planning of the research lesson with respect to the different ways of experiencing the object of learning. In the present study learners' prior knowledge of foreign exchange was explored through a pre-test diagnostic assessment before the design experiment was conducted or the research lessons were taught.

iii. The third step involves planning and implementing the lessons, with the educators and the researcher working together to address the critical aspects which have been identified. Part of the goal of this step is to establish a course of action and develop materials with a focus on the particular object of learning.

iv. The main action in step four includes evaluating and revising the lessons by using a post-lesson study or post-test to ascertain how well the students have developed the target capability. The recorded lessons are analysed, specifically by focusing on how the object of learning is handled. A comparative analysis of what happened in the classrooms is done to relate differences in the learners' capabilities in handling the object of learning to differences in how the object of learning was handled in the classrooms; and

v. The final step concentrates on reporting and disseminating the results, including documenting and reporting the aims, procedures and results of the attempts, and distributing the resulting documents to other teachers or to the public so that practitioners and researchers in the educational field can learn from the study. This research was meant to develop a learning study for practitioners as well as pre-service teacher education, particularly as a supplement to Outcomes-Based Education.

Learning study can be used to enhance educators' pedagogical capabilities and professional development (Pang, 2002). Learning study approach can become a component of educator development courses for in-service education, teacher education programmes for pre-service teacher

education, or higher education programmes for university teachers (Marton, 2001). In documenting the experiences which educators have gained during the learning study, the professional knowledge of educators can be shared, and "a collaborative consciousness" can be developed (Pang, 2002). With the object of learning as the organising principle, cumulative development of insights into how certain educational outcomes can be achieved is made possible.

3.4. Procedure

In this research, the researcher led four secondary school educators of EMS to jointly develop instructional materials as a means of achieving an agreed learning outcome. The purpose of the study was to develop the capability of learners to demonstrate an understanding of Rand price determination on the Foreign exchange market (the object of learning). The specific and measurable outcome was to develop a qualitative understanding of the object of learning, including the skills to handle the problem, and to present the results in the form of graphs (Pang, 2002).

Four EMS educators from four different schools within North West Province participated in the main study. The educators and myself discussed, during three preparatory meetings (each of which lasted for around one hour), how the object of learning could best be handled. Drawing on their experiences and the results from the pre-test in which learners' qualitatively different understandings of foreign exchange were assessed, the group developed a joint lesson plan for a series of three lessons, which were then taught in their respective classrooms. All lessons were observed

and/or videotaped and subsequently analysed together with the written tasks in terms of the enacted objects of learning (Pang, 2002).

After the series of lessons presentations, learners' understanding of the topic concerned was evaluated. All learners were required to complete a written task and three learners from each school were chosen randomly for interviews.

Based on the data obtained on the teaching and learning, inter school comparisons were conducted to explore qualitative differences in the ways that educators handled the same object of learning, and the learners' qualitatively different ways of making sense of the phenomenon in question (Pang, 2002).

According to Pang (2002), the purpose of the learning study is threefold, which purpose also served this current research: firstly, to assist educators find an effective way of handling a rather difficult but important economic concept for secondary grade nine learners; secondly to test the tenets of the theory of variation which state that learning to experience something in a particular or certain way is contingent on the experienced pattern of variation in the critical aspects of the object of learning; lastly, to investigate how the use of a learning study helps educators to improve their teaching and make learning possible.

Justification for the Selection of Participants for this Study

Another important factor about this research that needs mention relates to the participants involved. It is a fact that EMS was introduced to secondary

school curriculum in 1998 as a result of OBE. As a specialised learning area, a majority of the schools do not have qualified teachers in this specific field and in the North West Province, and particularly within the Central Region, very few schools have qualified educators by training and experience in the learning area. This lack of qualified educators is demonstrated especially by the Provincial Department of Education mass two-day educator development workshops in EMS, which attract large number of educators from almost all the secondary schools. A survey during teaching practice supervision exercise in January, July and August 2004 also revealed that out of over 20 schools visited during those periods in the Central Region only 3 schools had a qualified EMS educator and the large classroom numbers also made it difficult for them to cope.

The researcher, as mentioned below has had the opportunity to identify at least eight EMS educators whom he has not only taught personally but also who have the subject content qualification and experience. Since the focus was on the experiences of learners on a particular economic concept, the selection of four educators and four schools to participate in the study was deemed appropriate within this type of research, namely a phenomenographic study. According to Denscombe (2005) phenomenographic research does not normally involve large numbers or instances of the phenomenon being studied. Even though this may raise the issue of how far it is possible to justify generalisations, according to Denscombe (2005) phenomenographic researchers do not regard such a concern as relevant to their work.

Apart from Denscombe's view, evidence from practice show that since the focus in all cases has been on learning, and in nearly all cases educator

participants have been very few in number. For example, in chapter 2 and in the studies sited, Dahlgren (1976) educator participant was 1 with 38 learner participants; Dahlgren (1978) had 1 educator participant and 15 learner participants; Dahlgren (1979) used 1 educator participant and 120 learner participants; Thomas (1983) had 1 educator participant and 236 learner participants; Rovio-Johansson (1999) used 3 educator participants and 45 learner participants; and Pang & Marton (2003) utilised 10 educator participants and 356 learner participants. The Pang and Marton study used a relatively larger number of educator participants but in general the trend for this kind of research has been on using smaller numbers of educator participants, mainly because of the focus of the research.

Another important factor in this kind of research and educator participant issue is that larger educator participants could interfere with the intended object of learning due to the effect of instrumentalism, where many educators' style may interfere with the variations required and hence create many dimensions of conceptions which could interfere with the object of learning and the results of the study. As mentioned, the emphasis is on the learners, and the context is to establish how a particular theory has influenced the understanding or learning experiences of a specific concept in a particular manner.

3.4.2 Participants

3.4.2.1 Educators

Four educators were involved or participated in this study, the educators were chosen for this study based on the following:

- These were educators who formed part of a group of teachers who did ACE (Advanced Certificate in EMS Education) and subsequently studied for BEd (Honours) in EMS Education under guidance. They had used phenomenographic studies as a point of departure during their studies in teaching and learning principles in both the ACE and the BEd (Hons) courses. They were therefore familiar with the methodology. The study found it expedient therefore to utilise these four educators for this study. Out of the 8 educators with the same qualifications and experience consulted, only these four came out voluntary to join this study hence the four educators and their schools were used.
- All were qualified EMS educators with a minimum qualification level of Required Education Qualification Value (REQV) 14. What is noticeable among their characteristics is that all the participant educators were qualified EMS educators with an average of over 10 years post qualification teaching experiences. They were also Setswana (mother tongue) speaking but the medium of instruction utilised by all the teachers was English.
- To enhance the internal and external validity, the same theme and lessons as well as evaluation mechanism were used. They all taught grade nine using the same learning programme. They were all teaching in public schools and they did not differ in terms of resources and other learning support systems. The schools were all located in areas with the same environmental backgrounds. The lessons developed had been based on the same existing school learning programme and had been the joint work of myself and the educators or presenters.

3.4.1.2 Learners

The learners in the groups were selected from the schools in which the educators were based. The schools were all public schools in the NorthWest Province with similar characteristics in resources. Only grade nine learners were used for the study. All grade nine learners in each of the four schools were utilised for the study. Differences in terms of learner expectations and achievement among the learners did not differ. There were altogether 200 learners who took the pre-test and 161 learners from the 200 who took the post-test. The other 39 were absent or voluntarily did not participate in the post-test. Besides, only those who attended all the lessons wrote the post-test. They were all in the age group range of 15-16.

Pre-tests were conducted to ascertain the learners' understanding of the phenomenon in question before the lessons. It was found necessary to undertake the pre-tests to determine the learners' understanding of the concepts prior to the lessons. The pre-test was also meant to investigate the qualitatively different ways that they experienced the phenomenon of foreign exchange market.

The learner data obtained were coded and analysed to derive the categories of description and thus the outcome space (discussed in chapter 6), which helped the educators in the main study to identify the critical features of the object of learning when they planned their lessons. Another reason for the pre-tests was to determine the nature of pre-instruction understanding of the topic. This would establish the similarities and

differences in pre-instruction understanding. Educators would be able to establish the basis for developing the lessons. The pre-test was undertaken with the fact that learners had earlier in the previous school term been taught the topic in the normal course of the school programme.

Three learners from each of the participating schools were selected for interview. In selecting the 3 learners from each school to attend the interview, presuppositions about the nature of conceptions held by particular *categories* of individuals were avoided. I used the Random sampling technique, which was based on the Random number table (Wiersma, 1995). This method ensured that learners were not selected based on their performance but each participant had an equal chance of being interviewed.

3.5 Data Collection Procedure

Using Pang's (2002) approach, data was collected through the following methods: preparatory meetings, class observation, video-recording the lessons, and teacher interviews, as well as learner written tasks and interviews. A pre-test was conducted prior to the main study.

3.5.1 Pre-test

A pre-test involving all grade nine learners (200 learners) from the four schools was conducted. *They had all been previously taught the concept or topic in the normal school teaching programme.* The study attempted through the pre-test to identify the qualitatively different way in which learners made sense of the foreign exchange market, so as to provide

input for study as well as a comparison in learning outcomes for the main study. Participants' understanding of the topic which had already been taught by the same educators before the pre-test, with the usual learning and teaching strategy, was tested by requesting these learners, on paper to answer the question as presented in chapter 4. The results also provided an indication that the learners had been taught the concept before the pre-test.

The dates for the pre-test were May 17th and 18th 2005 in schools A and B and 25th and 26th May 2005 in schools C and D respectively.

It is stated here that the researcher prior to the pre-test visited the classrooms of the same educators and observed the nature of learning and teaching activities. These visits took place between February 21 and March 4th 2005 and each educator was visited not less than twice during EMS lessons. The researcher and the educators agreed that the learning and teaching strategy had not followed the variation of learning approach and the educators mainly utilised the normal teaching approach which was based on text book teaching, where the educator would read and explain from the textbook and learners would listen, copy and work on exercises. These classroom visits did not coincide with the teaching of the study topic; nevertheless the visits provided information to the researcher on how the educators go about their learning and teaching activities, which did not integrate the variation theory of learning at the time of visits.

The responses from the 200 learners in the pre-test were analysed (chapter 4) in a phenomenographic way in order to reveal their conceptions regarding the concept of Rand price determination on the

foreign exchange market. The findings from both the written tasks and the interview were shared with the participating educators in the main study.

3.5.2 The Main Study

During the main study, the researcher adopted three processes for the methodology. The pre-test had revealed the different understandings that the learners had of the phenomenon in question, making up their different conceptions or "ways of experiencing" as analysed in chapter 4. These formed the basis for the main study.

3.5.2.1 Preparatory Meetings

To start with, the topic of Rand price determination on the *foreign exchange market* was introduced to the educators during the preparatory meetings. The purpose of these meetings was to expose them to the pre-test-post-test retention design and to decide on the choice of the topic. It was unanimously agreed that it was an important topic and a difficult one for learners. As Pang (2002) pointed out, the educators have no hesitation in trying to find ways to make it possible for their learners to understand the concept. The educators met three times at the Mafikeng Campus of North West University, between June 21st and July 15th 2005 and all of them were asked to think about the following assessment criteria or assessment standards and share their views:

i. What are the major issues in teaching the notion of foreign exchange market?

ii. What are the common errors and confusions that learners experience when learning this topic?

iii. Have you ever helped learners to overcome such difficulties in the past and how?

During the second meeting, the educators were invited to draw on their own experience and share with one another how they handled the same object of learning. They also discussed performance indicators, how to achieve the object of learning more effectively and also to reflect on the following issues:

- How did learners make sense of the topic on Rand price determination?
- How did you handle the same object of learning in the past?
- What were the difficult points of teaching the notion of foreign exchange market?
- How could we make learners develop a new way of seeing the notion of Rand price determination on the foreign exchange market?
- Which way of teaching the topic expressed by the participants did you think was better?

During the third meeting the educators worked out the teaching sequences and produced a teaching plan for the series of three lessons together. After the preparatory meetings the lesson plans and teaching materials were developed. To determine the prior knowledge of the learners, a pre-test was conducted as discussed above. Educators were also required to provide schemes or learning programmes to determine learners' prior knowledge on foreign exchange.

3.5.2.2 Class observation and Video-recording of lessons.

To enable effective analysis, lessons were videotaped and field notes were taken between 15th August and September 22nd 2005 to record some special events that happened beyond the camera and which could not be seen from the transcripts. Educators had independence in implementing the plan in their classes in line with their own personal styles and with any modifications that they considered necessary. I attended all of the lessons in order to experience how the educators "structured their lessons and dealt with the object of learning in the actual classroom contexts", (Pang, 2003:123). The lessons were analysed (see chapter 4).

3.5.3 Educators' Interview

In order to understand their qualitatively different ways of understanding their handling of the object of learning, their views on their lesson presentations and their views on the theory of variation, the educators involved were observed on their classroom activities and interviewed individually through semi-structured questionnaires (chapter 4).

3.5.4 Written Tasks and Interview with Learners

Learners were given the opportunity to articulate their experiences in written and spoken form. The interviews were conducted personally by the researcher and together with the written tasks, which were the same as those administered during the pre-test, had the intention of ascertaining the extent to which learners had developed the capability of seeing foreign

exchange market from an economic perspective. The interviews and the written tasks were also intended to "bring to light the ways in which the people being studied experience the phenomenon of interest" (Marton & Booth, 1997:129).

One hundred and sixty one (161) of the same learners who took the pre-test wrote the written tasks in the post-test but three learners were randomly selected for the interview. In both written tasks and interviews, the questions were open-ended and allowed learners to reflect on their own experiences of the phenomenon in question in an unrestricted atmosphere. The questions also attempted to provide learners with a context or situation in which to express their ways of understanding the economic phenomenon of Rand price determination on the foreign exchange market in the South African economy. However, the interviews were used to "thematise the participant's experiences" (Pang, 2002:127). The interviews were summarised and recorded with the learners' verbal consent and took place in a quiet environment with only the researcher and one interviewee present at a time. Each interview lasted about 15 to 30 minutes. Interviews took place between September, 20th and 30th September, 2005. Details of both interviews and written tasks are analysed and interpreted in chapter four.

3.6 Data Analysis Procedure

3.6.1 Teaching

Lessons were observed and some were video-recorded with each presenter's consent, transcribed, and the analytical framework of variation

was adopted to analyse the teaching data. Attention was focused on the analysis of the classroom data on the dimensions of variation in the lessons – in other words, those aspects that were varied simultaneously as well as those aspects that remained invariant. Similarities and differences in terms of the patterns of variation found in the lessons were identified. The analysis of the teaching data was supplemented by other sources of data such as those from the preparatory meetings, the interviews with the teachers, the lesson plans submitted, and the field notes made (Pang, 2002). In each of the above, the emphasis was on revealing how educators use variations to assist learners to discern the critical aspects of the concept.

3.6.2 Learning

Following Marton's (1986) advocacy that the outcome of learning is most suitably expressed in terms of the learner's conception of the phenomenon, the variation in experiencing the phenomenon was characterised in terms of 'categories of descriptions', and an 'outcome space' of the phenomenon in question was derived (Pang, 2002). Analysis commenced after the written tasks and the interviews had been completed. As Emanuelsson (2001:250) once observed, "in order to make distinctions in other peoples' ways of understanding something, this something must be kept invariant and acts of knowing must be allowed to vary in relation to the invariant object of knowing". In order to reveal variations in learners' ways of experiencing the phenomenon of foreign exchange market, the different conceptions of the phenomenon were categorised in the form, revealing the critical aspects of learners' experience of the concept. In line with the objective of the study, attempts were made to use the theory of variation

to account for the way of experiencing and to help design instruction in order to bring about learning in the classroom.

Descriptive data is presented in chapter 6 to enable us to see the world with the eyes of the respondents. Interpretation of the data was based on hermeneutics approach in the sense that the *purpose was to discern the critical way of experiencing something.* The analysis followed the pattern used by Pong (2000) and Pang (2002) in their studies. Comparisons on learning outcomes were made between pre-test and post-test as well as between schools using statistical analysis in order to measure whether or not there were any significant differences. The main purpose is to develop learners' ways of experiencing an EMS phenomenon by drawing on the qualitatively different conceptions held by learners, and also to describe learning outcome according to descriptive statistics as well as the outcome space model which I developed in terms of phenomenography. The next chapter therefore deals with the analysis of the data from this study.

3.7 Summary

This chapter has focused on the research methodology for the study. I have indicated that the concept of foreign exchange market which deals with the Rand price/value determination is the main focus for this study. The object of learning which the educators and myself agreed upon, was to assist learners develop a capability to consider the notion that the price of the Rand is determined by the supply and demand factors on the foreign exchange market. Based on the literature and the OBE practice, the variation theory of learning was adapted for the study. The description of the study followed with a detailed account of the characteristics of the

participants, the data collection and analysis. The study utilised a pre-test - post-test retention process on learning outcome based on how the Rand price/value is determined through the foreign exchange market. The pre-test was followed by classroom teaching using the learning study approach with input of the theory of variation.

The teaching was done in four schools over a four-week period of teaching between 15th August and September 22nd 2005, in which the four educators selected on voluntary basis did the teaching. The data from the teaching and learning of the EMS concept was collected by means of: preparatory meetings; class observation and video-recorded lessons; written tasks by the learners and interviews with both learners and educators. During the data collecting process, ethical and accessibility issues as applicable within the Department of Education as well as the individual schools were considered. The data analysis process followed the conventions of phenomenography. The researcher invited a very experienced EMS educator with solid background in education to make an independent judgement of the categorisation of the conceptions. The findings of the study in terms of learning and teaching are presented in the next chapter.

CHAPTER 4

ANALYSIS OF FINDINGS

4.1 Introduction

The main principle behind the NCS as enacted in 2002 for EMS is to provide developmental and critical outcomes to ensure that the learners become true citizens of the country (Department of Education, 2002). The purpose of this study as outlined in chapter 1 was to investigate, using the theory of variation under the phenomenographic studies, how a selected group of grade nine learners experienced the learning of a particular concept, "foreign exchange market", in EMS. The focus of the analysis is based on what learners learnt and not how much they learnt. This chapter reports on the teaching aspects, that is, how the intended object of learning was extended to develop the capability of the learners. The main focus is, however, to report the findings of learning outcome and draw on the data that were collected from written and oral responses.

The data contained 200 and 161 sets of answers for pre-test and post-test respectively, including the 12 interview responses. The data also include video analysis of classroom activities on foreign exchange market. The interview and the video analysis reinforced the written responses and also served to bring to light some in-depth understandings of the learners concerning the topic. Two students from each class were chosen randomly to attend an interview in which they were asked to provide *self – generated* (Pang, 2002; Pang and Marton, 2003; Marton and Pong 2005) examples on foreign exchange market. The main focus of the interview was to afford learners the opportunity to verbally express their view on

foreign exchange market: the question was: *Having attended the lesson on foreign exchange, explain how the price/value of the Rand is determined on the foreign exchange market.*

Both the written and the interview responses as well as the data from the video clips have been integrated into the data under teaching and learning responses. The responses from all these sources appear to be the same and were brought together under the categories or levels of conceptions on the outcome space levels. As the vast majority of African children used in this research had very serious English language problems, instructional support materials and test items had to be presented in language pitched at their level and which they found comfortable. During the study process, educators adapted a "spiraling" method (presentation of content, concepts and skills at the right level) in addition to the theoretical framework within which this research was located.

To report on the findings in terms of student learning outcome this chapter is divided into sections. Section 4.2 deals with the teaching analysis on the intended object of learning. Section 4.3 deals with conceptions of learning or what is described in phenomenographic studies as the qualitatively different ways in which the learners understood 'foreign exchange market'. The object of analysis as in phenomenographic study is to reveal the qualitative variation in ways of experiencing a phenomenon regardless of whether the differences are differences between or within the phenomenon (Marton and Booth, 1997). In this regard, 4 conceptions were identified in this study for both the pre-test and post-test, within 3 outcome space levels (see Diagram 3 below). In section 4.4, the pre-test and post-test results in terms of

learning outcomes are presented, using descriptive statistical analysis to reveal differences in learning outcome. A summary concludes the chapter.

4.2 Analysis of Findings - Teaching

This section focuses on the main study in the area of intended objects of learning, and discusses the learners' capability, which the educators intend to develop. The data is based on how educators enacted the intended objects of learning in their teaching, in terms of what might have been experienced by the learners in the classroom (Pang, 2002; Pang and Marton, 2003; Marton and Pong, 2005). This section is based on the key research question on page 7: *how can educators make use of the theory of variation as a resource for making a particular kind of learning possible in the Economics and Management Sciences' classroom?*

4.2.1 The Intended Objects of Learning

As explained in chapter 3, four educators from four schools participated in the study. Unlike the normal routine lesson in which educators choose lessons themselves based on the particular specific outcome as stipulated by the learning area, the researcher particularly introduced the topic to the educators. They initially thought it might be better if a topic was selected which they had not already taught, but since there was a need to establish a basis for reporting the finding, it was finally agreed that the topic chosen for them by the researcher would be appropriate, namely, 'the foreign exchange market'.

The overall aims of Outcome-Based Education was discussed with specific reference to EMS and from there an agreement was arrived at about the object of learning for this study, that is, to facilitate the development of an economic way of understanding the determination of the South African Rand price or value by using the notion of the market forces of supply and demand. Based on this agreed object of learning, educators were assisted to plan and develop a series of lessons for grade nine learners in their respective schools.

4.2.2 The Intended Objects of Learning for the Lessons

The educators and the researcher agreed after the pre-test to identify five aspects of the phenomenon in which learners had made common mistakes. We identified for example:

- the concept of foreign exchange market and the participants;
- what constitutes demand and supply factors on the market;
- the construction of supply and demand curves,
- the concept of equilibrium point;
- the shift in the supply and demand curves.

We agreed that these technical aspects present the greatest difficulty which learners need to overcome in order to understand the Rand price determination. The lessons were developed with these difficulties in mind.

The following excerpts from the educators bring the above points home:

EA ...learners have difficulty understanding the various concepts...'

EB ...learners lacked the knowledge about the concepts...

We also agreed that learners in grade nine found the use of graphical illustration of the market mechanism as very abstract and sophisticated in nature due mainly, to the language of instruction which they find difficult to grasp in the first place. Conceptualization of the notion of supply – demand interaction at equilibrium was also difficult for them to understand if explained in the language of instruction.

EC Yes, my learners seem to understand at first, but when questions are asked to explain supply and demand forces and the equilibrium point, they simply cannot follow.

Educators also discovered that quite a number of learners tended to memorise and regurgitate only the examples given by them when the teachers conducted the equilibrium analysis, and as a results, learners failed to explain logically why demand and supply forces interact to establish the equilibrium point. They would rather bring in the non-market aspects of Rand price determination.

All the educators had a clear picture of the difficulties encountered by their learners and they came up with key suggestions regarding what to focus on in their instructional designs. I refreshed their memory on the concept of phenomenography and the theory of variation of learning that was covered during their professional training at the University. I revised with the educators, the theory of variation as an input for instructional design and presented them with some of the basic theoretical constructs of the theory of variation (as detailed in chapter 2) in a less technical way. I tried to exemplify how the theory of variation could be applied to EMS

education, by making use of examples drawn from the teaching of the notion of market price at grade nine levels and the supply and demand for goods and services in grade seven. I reminded the educators of the notion of "ways of experiencing" using the example from Pong (2000) on the "conception of price" in chapter 2. I told them that the four qualitatively different ways of conceptualizing price could be accounted for by the different aspects of the phenomenon that were focused upon and discerned.

I reminded them of the Tullberg (1997) research on "the mole" and provided them with example from Pang (2002:142) on the "conception of price":

> ...you may note that for Conception A, what is focused upon by the students is the physical features of a particular object, for example its size, weight, shape. They relate the price with the physical characteristics of the goods concerned such as size and shape. However, for Conception B, C, and D; the object is regarded as an example of generic objects, say dolls as a whole. So, the critical aspect of experiencing price is the concept of market. If they focus on a change in demand only, then Conception B will come out. For some who focus on a change in supply only, it will lead to Conception C. Some focus on the interaction of changes in demand and supply, then it will give rise to Conception D, However, back to Conception A, those holding this conception take the concept of the market for granted. In fact how people conceptualise price depends on what aspects they focus on and discern.

After the revision of the theory and its application, the educators were willing to try out the theory of variation in their planning but with the researcher's constant monitoring and support. The lessons developed had input from the researcher and were based on the educators' experiences and intuition together with

insights from the theory of variation in relation to the learning study as outlined in chapter 3. One educator commented:

EA: I use intuition and experience as methods, as learners lack most ideas of the lesson to be taught"

Appendix A relates to details of the lessons presented.

4.2.3 The Enacted Object of Learning

The lesson plan served to demonstrate the intended object of learning, but it is the enacted object of learning, that is, the object of learning as it is *actualized* in the classroom, which has an effect on learning (Pang 2002). Whether the intended object of learning was actually enacted in the classrooms hinged on a number of contingencies such as the immediate feedback of the learners, the understanding of the lesson plan by the educators, language of instruction, learners' predisposition, time table, to mention but a few.

In this particular study, some of the educators did less than what was planned in the lesson programme, whereas others went out of the way to improvise and expand the original programme schedule. This accounted for the difference of gap between the intended and enacted object of learning. In the analysis of learners' results, the educators' performance factor cancels itself out in the sense that in the study, each educator handles his/her own school, the same learners and the same topic both before and after the pre-test. The emphasis was to focus on learning outcome between pre-test and post-test in each school based mainly on the

introduction of a new learning strategy into classroom activities Differences in learning outcome between schools could also be attributed to location and access to learning support systems but whose influence on this study was discounted as explained above

With reference to this study, and in terms of the theory of variation, the enacted object of learning is described in terms of what is varied and what is kept invariant in the classroom teaching, and the different relevant dimensions form a space of variation or, according to Pang (2002); Pang and Marton, (2003); Marton and Pong, (2005) a space of learning. These differences in educator factor in the implementation of the theory in the classroom have been responsible for the differences among participating schools between the intended and enacted object of learning and perhaps speculatively explained the mean differences in learners' understanding of the concept, even though the differences are not significant enough to separate the schools in terms of performance levels (Table 5). Table 2 is a summary of the enacted object of learning as presented by the educators.

Table 2: Comparison among Educators on the Enacted Objects of Learning.

	Educator 1	Educator 2	Educator 3	Educator 4
Building up Relevant Structure	Yes	Partially effected (did not use the Nigerian and RSA example)	Yes	Partially effected (did not use the Nigerian and RSA example)
Revealing variation in the learners' ways of understanding	Partially effected. (Pre-test plus class interview)	Partially effected (Pre-test plus class interview)	Partially effected (Pre-test plus class interview)	Partially effected. (Pre-test but no class interview)
Introduce variation in the dimensions of market demand and supply for South African Rand	Yes	Yes	Yes	Yes
Introduce variation in the critical aspect of interaction and shift in demand and supply curves simultaneously	Yes	Yes (but not much flexibility for learners to present or demonstrate their own variation)	Yes	Yes (but not much flexibility for learners to present or demonstrate their own variation)
Contextualisation and consistency of sets of representation	Yes	Partially effected (did not use the case of Diamini and his export and import business in the last lesson)	Yes	Partially effected (did not use the case of Dlamini and his export and import business in the last lesson)

Adapted from Pang (1999); Pang (2002); Pang and Marton (2003)

4.2.4 Summary

All the educators focused on the object of learning, which had been agreed upon, and which was to facilitate the development of a specific learning outcome, that is *Rand price or value determination*, taking into account the foreign exchange market. During this study, the educators had not thought about classroom organization or the instructional support systems such as group, self-learning or the integration of information technology. Instead they focused mainly on how to deal with the object of learning in the lesson presentations. The educators, however, employed the learning study method as explained in chapter 3 using different learning techniques to facilitate the intended object of a learning, for example, the use of practical examples from case studies such as that of business person, Dlamini, who was an exporter and importer, of chemicals from Nigeria and exporting plastic products to United Kingdom, Botswana and Nigeria.

The educators also utilized research activities in the form of products and services, which were produced locally and abroad. In this way as Marton and Booth (1997) stated, the educators were trying to build relevant structures to facilitate learning. It should be mentioned that the study also exposed the differences in educator approaches towards facilitating learning. Angelo and Cross, (1993) concluded in their findings that *what* one teaches has a good deal to do with how you teach – or at least with what your teaching priorities are and how you perceive your primary role as an educator. *What* you teach is also a better predictor of your teaching outcomes or enacted object of learning and role than *where* you teach.

The study also found out that the intuitive use of variation was a key feature of all the teaching and they all introduced variation in the dimension of equilibrium points of supply and demand for currencies, particularly the South African Rand and the USA Dollar. The critical differences however, in the enacted object of learning and hence the different patterns of variations constituted in the classroom, were reflected in the ways of experiencing that the learners manifested after the lessons as shown in sections 4.3 and 4.4 below.

4.3 Analysis of Findings - Pre-test and Post-test

Sections 4.3.2 and 4.3.3 below show the phenomenographic analysis and findings of the pre-test, before the lessons and post-test, after the lessons results respectively. The responses from the 200 and 161 learners respectively, were categorised into four main conceptions as indicated on the outcome space (Diagram 3). The individual results were categorised hierarchically into 4 conceptions in terms of the similarities of the responses and also within the phenomenographic approach (Chapters 1, 2 and 3 refer). For example, conception 1 represents the kind of meaning or learning experience a group of learners gave in response to the pre-test question. A description of each conception follows within the context of referential and structural aspects. Sections 4.4 however contains the statistical analysis of pre-test and post-test in terms of the differences, if any, in learning outcomes as well as comparisons between schools. The analysis and findings were necessary to respond to the research questions outlined in chapter 1.

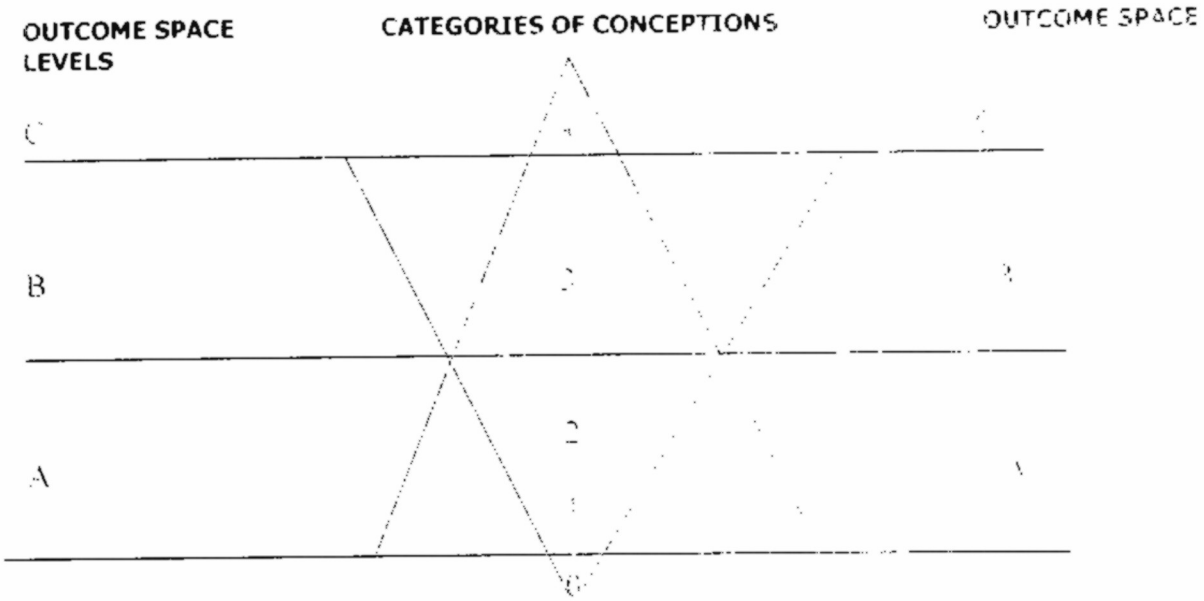
4.3.1 The learning Outcome

4.3.1.1 The Outcome Space

In this study, the agreed object of learning was to help learners to develop an economic understanding of the *determination of Rand price or value on the foreign exchange market,* by making use of the notion of the market supply and demand forces.

To determine the extent to which this was achieved, learners were evaluated to determine whether they had acquired an advanced way of understanding the phenomenon at the end of the study, with reference to the outcome space derived for the phenomenon. Three levels, A to C, with C being the highest level of the outcome space and A the lowest, were predetermined in which learners' conceptions were placed. These predetermined three levels, A to C as represented in diagram 3 page 146, helped to establish the outcome space in which learners at this level could be categorized according to their logical inclusiveness and adequacy. The more dimensions of variations to be taken into consideration simultaneously, the higher level the conception would be in the hierarchy of the outcome space (Pong 1999; Marton and Booth, 1997; Pang, 2002; Pang and Marton, 2003).

Diagram 3 **Outcome Space for Levels of Conceptions of How Rand Price/Value is Determined on the Foreign Exchange Market**



4.3.2 Analysis of Findings before new lessons - The Pre-test

4.3.2.1 The Outcome space

The pre-test was conducted to reveal four qualitatively different ways of conceptualizing the Rand price determination (conceptions 1 to 4). The pre-test was conducted to make comparisons possible with the results from the main study. The pre-test was done before the main study by the respective educators. All the four conceptions were identified in both the pre-test and post-test, and they represented the variation in the ways in which the learners experienced the phenomenon (Marton, Dall'Alba and Beaty, 1993; Pang, 2002).

The following written questions were set for the pre-test.

> one of the problems associated with international trade is that each country has its own unit of money, which can generally not be used in another country. For example, the Nigerian Naira is of no use to a South African exporter who sells cars to a Nigerian importer unless (a) the exporter wants to buy Nigerian oil with the Naira or (b) he can exchange Naira for Rand. Alternatively, he may receive payment in Rand, in which case the buyer must obtain Rand with his Nigerian currency. Explain w*hat demand and supply for the Rand is in the above example. Explain how the price or value of the Rand is determined on the foreign exchange market.*

A conception (different way of understanding an object) has two intertwined aspects (Marton and Pong, 2005): the *referential* aspect which relates to the global meaning of the object conceptualized; and the *structural* aspect, which indicates the specific "combination of features that have been discerned and focused on" (p.335). In this study the learners' conceptions on Rand price determination have been categorized in terms of the nature (structural) and meaning (referential) attached to the different ways of experiencing the phenomenon (price of Rand determination). Collectively, these conception categories or levels, (1-4) describe the range of ways that the difference in learning the concept at the grade nine level is experienced across the group. In the pre-test results, only 3 out of the 4 conceptions were generated by the learners.

4.3.2.2 Categories of Conceptions for pre-test

This section relates to the results from learners in response to the pre-test written task. All the learners answers were categorised into four conceptions, based on the similarities of the responses. The conceptions stated below constitute the learners understanding of the topic on how the Rand price is determined on the foreign exchange market. This was based on what they had been previously taught on the topic before the pre-test

was introduced and before the new lessons were present on variation theory of learning. As explained earlier and plotted on the outcome space (diagram 3), conception 1 represents the lowest level of understanding of the topic whereas conception 4 represents the highest level of understanding. Analysis of each conception in terms of phenomenographic approach follows the learners' stated conception. Compared with the post-test results, and as shown in Table 4 the pre-test did not reveal learners' understanding at conception level 4.

Conception 1

This conception was shared by 7.5% learners who took the pre-test (Table 4). The statement below represents how these learners understood the Rand price determination.

If the economy is doing well and if there is no crime then the price of the Rand is fixed.

The conception implies that price is the function of economic benefit and the way politicians conduct themselves. South Africa has two economies, namely the first world and the third world economies. Structurally, the focus is on 'economy and crime'. When the Rand falls, most economic commentators who belong to the first world economy usually blame the fall on the criticism leveled on Government inability to manage the economy or the Government's support for President Mugabe. In this category of conception, learners failed to focus on the critical aspect of the market mechanism in Rand price determination.

The critical aspect of the Rand price is denied and ignored. The object of focal awareness is the *economy* and *crime* as Rand price determination. In terms of the referential aspect, the learners focused on *performance* of the economy and *effect* of crime. This is captured by learner (L135) who said, *"the price or value of the South African currency is determined by the rate of south African growth and crime".* Learner (L90) stated "*...according to the economy and how it is doing*". L91 stated that "*it depends on whether there are good things happening or bad things happening. If good things happen the value of the SA currency will go down and if there are bad things happening the value of the SA currency will go up"*

This implies that non-market forces determine the Rand price. Even though productivity level seemed to be mentioned as a factor, there is no market mechanism involved in this type of conception. The variation is that, learners see crime and the productivity levels as the influence factors on Rand price. That means if crime levels increase, less goods and services are produced, and the value of the Rand decreases, the price of the Rand in terms of other currencies increases. The reverse would see high production levels and the price of the Rand in terms of other currencies would decrease.

Conception 2

This conception was also presented by 88% (Table 4) of the participating learners. Majority of the learners understood the concept in the form of the statement below. Compared with the post-test (67%) and after the new learning strategy had been introduced fewer learners had this conception. There was an improvement on the understanding after the new learning

technique was introduced. Example of this conception from the learners is indicated.

The price or value of the South African currency is determined by the policies of the Government.

According to this conception, the price of the South African Rand is determined by Government policy. This structure of understanding of Rand price is based on the nature of the policy. For example the Government could rule that the price of the Rand should be R7.00 to a Dollar or so. The element that was focused upon here was the Government. There was no reference to any of the market mechanism. The respondents went on to further clarify their responses by saying that the Minister of Finance undertakes the buying and selling of the South African currency. This conception is similar to that of conception 1 because the focus is shifted from the economy to Government policy. The structure is still on the Government policy, but as a free enterprise economy, Government policy may influence international trade in terms of imposition of duties, but critical focus is not the market supply and demand of the currency. Structurally, in this case the Minister of Finance determines the Rand price. The variation is that the Government is another market force, which can intervene to determine the price. Perhaps in a developing economy like that of South Africa, which has foreign exchange restrictions such as how much a traveler can take out of the country in a year, Government policy as a structural aspect may create a variation between the market and the demand and supply factors. In terms of this research, the critical aspects of demand and supply forces have not been focused on.

Further examples of this conception as presented by learners include L80 who explained Rand price determination as "the South African currency is

determined by bank laws and department of finance" *L145 stated that* ":...the South African Rand is fixed by the Department of Foreign Affairs and the Reserve bank".

Conception 3

This conception is higher than the previous but short of the referential aspect of the topic. Only 4.5% managed to achieve this level of conception in the pre-test. After the lessons were introduced 17.4% learners achieved this conception (Table 4). Learners in this category demonstrated that they partly understood how the Rand price is determined. Below is the statement of the learners' conception followed by the detail analysis in phenomenological terms of the learners understanding of this conception.

The price of the Rand is determined by the amount of money South Africa gets from selling to other countries.

Here the Rand value is the function goods and services South Africa sells to other countries. This represents only one dimension of the demand side. Structurally in this case only the demand side was focused. Referentially, the price or value of the Rand was conceived entirely by demand forces. For instance, L77 stated "*Rand price is determined by all the Dollars from other countries to South Africa.*" L65 was quoted as saying" "*the price or value of the Rand is determined by other countries who buy from South Africa*". In terms of the dimension of variation, the learners' focus was on the 'amount of goods and services South African is able to export'. The more South Africa is able to sell to other countries, the higher the value of the Rand. This means the price which foreigners pay for the Rand in terms

of their own currencies rises. The critical aspect here is the failure to show the Rand price or value as a relationship between demand for Rand as well as the supply of Rand in terms of other currencies.

Table 3 (Pong, 1999; Pang, 2002; Pang and Marton, 2003; Marton and Pong 2005) summarises the referential aspect and the structural aspects of the conceptions at pre-test. The referential aspect refers to the overall meaning the learner gives to the phenomenon, whilst the structural aspect refers to the aspect(s) of the phenomenon being focused upon, as evidenced by the variation brought about. In terms of the hierarchy or categories of conceptions held by respondents of this research, conception level 4 was not achieved by the learners in the pre-test. Outcome space level C was therefore not covered in the pre-test.

Conception 4

None of the learners who took the pre-test provided an understanding at level 4 conception, based on the referential aspect of the understanding of the concept. This means that even though the same learners had been taught the concept before the pre-test in the usual course of their school programme using the usual learning and teaching strategy, by the same educators none understood this concept at level 4.

4.3.3 Analysis of Findings after new lessons - Post–test

4.3.3.1 The Outcome Space

Soon after the pre-test, the educators were supported by the researcher and a series of lessons were developed and conducted by each educator in his or her respective schools. The lessons were spread between August and September of the same year. In order not to disrupt their normal school work, the lessons were conducted during the prep periods and each teacher held a minimum of three lessons, on the foreign exchange market, based on the Theory of Variation as explained in the research. Assignments and homework were given intermittently during the lessons but a written task was given to learners at the end of the lessons. The final question was based on the article below:

"Having studied the foreign exchange market mechanism and Rand price in a free market economy read the article below by Weinberg (2005) and explain how the value or price of the South African Rand is determined:

> ...the hysteria surrounding what is simplistically called the "overvalued Rand" is a matter of serious concern. It is not made lighter by the recent irresponsible (and I think disingenuous) comments of Ian Plenderleith, Deputy Governor of the Reserve Bank, that the Rand's strength is unwelcome. The Rand is 14% weaker against the Dollar than at the beginning of the year (when Plenderleith said nothing) it is currently one of the weakest-performing currencies in the world: it has weakened against the pound and the euro, even though these currencies are under pressure against the Dollar. Weaken the Rand and inflation will inevitably rise, putting an end to the growth that has been impressive of late, and only intensifying unemployment. A petrol price of R6 or more to the litre will have depressing consequences. Significantly higher petrol prices in the US are stalling the American economy. The Congress of South African Trade Unions has given up criticizing management of exorbitant salaries and failing to increase productivity: all the steam and anger is now

directed at the defenceless Rand. But unequal distribution of profits and undesirable levels of productivity are hampering the economy, not the Rand. It's time for Reserve Bank Governor Tito Mboweni, to calm down the hysteria and put matters right: the fact is that the relatively stronger Rand has been the one great stimulus to lower inflation, and, as the mark of a stable economy, has vastly improved SA's status internationally, reflecting increased confidence in the country."

The outcome space in phenomenographic study is a manifestation of the qualitatively different ways of learning experience. A phenomenographic view on learning as described in chapter 2 is that learning should be seen as a change in one's way of understanding certain phenomena (Marton and Booth, 1997).

The implication here is that there are qualitatively different ways of understanding a given phenomenon and, in this particular study the phenomenon of 'foreign exchange market'. According to Pong and Marton in Pang (2002), learners are used to have attained the object of learning when they come to see the phenomenon in a new way, that is, when they discern those critical aspects of the phenomenon that they had taken for granted or were not previously able to discern. It should be noted that at the time of the study, it was established that all the schools involved had covered the topic in their normal teaching calendar. The pre-test therefore was done under those situations.

The object of learning in this study as stated in chapter 1 was to help learners to develop an economic understanding of the determination of the price or value of the South African Rand through the foreign exchange market by using the notion of supply and demand principle. Learners were examined in an attempt to establish whether they had acquired an advanced way of understanding the phenomenon by the end of the study.

with reference to the outcome space derived from the phenomenon. To measure the qualitatively different ways of conceptualizing foreign exchange market, four conceptions of foreign exchange market were identified on the outcome space. Throughout the video examinations and analysis, the written task and the interview, I observed that some perspectives on Rand price determination tended to re-appear and that the same content could be viewed from different angles. This means that the learners' different experiences and conceptions of Rand price determination is not static and that the same individual could change conceptions from one question to another. Conceptions that were common were grouped together and categorised. According to Marton and Pong, (2005:335).

> ...these different ways of understanding or conceptions are typically represented in the form of categories of description, which are further analyzed with regard to their logical relations in forming an outcome space.

The result of this analysis resulted in four dimensions in which Rand price is determined. All the four conceptions were identifiable in both the written tasks and learners interviews and they represented the variations in the ways in which the learners experienced the phenomenon, thereby constituting the outcome space.

In this study four dimensions of Rand price determination were identified on the outcome space level (diagram 3) in a hierarchical form with conception 1 the least dimension of variation of the Rand price determination and conception 4 the highest dimension, which represented a more comprehensive and sophisticated view of the Rand price determination.

In terms the learners' responses to the written and the interviews tasks, the following conceptions identified were on the outcome space from the post-test results: that the Rand price determination is the function of the following:

1. None
2. Government
3. International trade
4. Demand and supply for the Rand

The dimensions or conceptions were consolidated and located within the three predetermined outcome space levels (Pong 1999; Pang, 2002; Pang and Marton, 2003). Level A is the lowest level where the conceptions 1 and 2 were placed. It is the lowest because the conceptions represent a less advanced and less inclusive view of Rand price determination mechanism. They suggest that in structural terms the Rand price determination is related to only one dimension of variation of the foreign exchange market. In referential terms (Pang, 2002; Marton and Pong, 2005), they represent the view that the South African Government determines the price or the value of the Rand. South Africa has adopted the free market mechanism and at the current state of the economy the Rand price has been determined by the exchange rate mechanism. This has been reiterated by the Governor of the South African Reserve Bank, Mr. Mboweni (2004), when addressing the shareholders at the eighty-fourth Ordinary General Meeting. The Governor said, the external value of the Rand is a function of the exchange rate mechanism.

Conception 3 is placed at level B and higher than A because the international trade can be deemed to form the basis for Rand price

determination and therefore may constitute an inclusively and complex discernment of how Rand price is determined (Pang, 2002; Marton and Pong, 2005).

Structurally, learners holding this view focus on two dimensions of variation simultaneously, namely, the buying and selling of goods and services between countries would determine the Rand price. These learners did not bring into their argument the equilibrium point at which the price of the Rand may be established. Under the international trade mechanism, learners only mentioned the supply of goods and services to other countries (see examples below). The value of the Rand increases (appreciates) when South Africa sells goods to other countries such as Nigeria. Learners have not experienced the complexity of interaction between supply and demand for a particular currency due to trade and other factors as basis for determination of Rand price.

Conception 4 is placed at the highest level in the outcome space C because it represents a more comprehensive and sophisticated view that allows for the interaction between the demand for and supply of the Rand on the foreign exchange market. The price or the value of the Rand is determined at the equilibrium point where demand interacts with supply. This price is known as the exchange rate. The foreign exchange market includes any place where the buying and selling of the Rand and other currencies takes place in terms of the foreign exchange rules and regulations. This conception is regarded as the most advanced in terms of the logical inclusiveness and complexity because it takes into account more dimensions of variation in a simultaneous manner than the other conceptions. Demand and supply as well as the market equilibrium are considered.

In the following paragraphs a detail discussion on all the learners' conceptions follows. The referential and structural aspects of these conceptions are examined. This discussion is done together with excerpts from the interview and written tasks to avoid repetition (Pang, 2002; Marton and Pong, 2005).

4.3.3.2 Categories of Conceptions for post-test

On the same outcome space as indicated in diagram 3, the responses from the learners from the written and interview tasks were categorised and conceptions were hierarchically placed. Compared with the pre-test results, the post-test results manifested an increase in learners understanding of the topic. The analysis and results showed that the lessons presented using the variation theory of learning had produced results in the sense that there was an improvement in learners understanding of the topic than before the pre-test when the same learners were taught by the same educators but using their usual or normal learning and teaching strategy. Below is the detailed analysis of the learners' post-test results, on the basis of how they understood the topic.

Conception 1

At the post-test no conception was identified as no learner's response could be placed in this category. This implied that learners understanding of the concept improved after they have been taught the new lessons.

Conception 2

The statement below represents learners who held this conception about the topic. 67% of the learners in Table 4 held this conception, compared with pre-test results of 88% from the same learners. The numbers of learners with this conception decreased in the post-test which implied that there had been improvement in the understanding of the same topic after the introduction of the new lessons based on the theory of variation of learning. The statement of the conception from the learners and details of the analysis of this conception in terms of the phenomenographic approach are described below.

"The Minister of Finance and the Governor of the Reserve Bank can determine the Rand price on the foreign exchange"

The meaning of post-test conception 2 is similar to that of conception 2 in the pre-test. The structural aspect here is the focus on the Government as the Rand price determinant. It is the Minister of Finance and the Reserve Bank Governor who constitute the market factors for the Rand price or value. The dimension of variation here is the power of the Minister and the Reserve Bank Governor as the custodian of South African money and as such they can decide how much the Rand should cost.

Currently the South African Government determines how much currency citizens can invest outside the country but South Africa has shifted from the fixed currency system to the *free floating exchange* system hence market forces largely determine the Rand price/value. In terms of this

research the critical aspects of demand and supply forces have not been focused on. One learner (L51) described, the Rand price as "*...the extent to which the Government enters the foreign exchange...*". Another learner (L78) explained the Rand price determination, as "*Government and Reserve Bank will tell the banks how much the South African Rand exchange rate is*".

Furthermore, another example is well stated by this learner (L3), "... *The price or value of the South African money is seen on the TV and the newspapers and the Government of South Africa decides on the foreign exchange rate through the Reserve Bank..*" L29 said "*.... The price of the Rand relates to goods and services that must be produced and sold cheaply in other countries.*"

These explanations imply that learners have focused on the Rand price as Government function and their understanding of the concept is focused on this aspect.

Conception 3

This conception as stated below was offered by 17.4% of the learners' total number who took the post-test. Compared with the 4.5% of the same learners who took the pre-test (Table 4), it could be said that there had been an improvement in learning after the new lessons were introduced. The analysis is followed by example of learners' actual responses.

"when international trade takes place and exchange of currency is necessary and that is when the Rand price or value is found. That a

country's currency is determined by how much the country can produce and sell to other countries.

Learners holding this conception understood the determination of the Rand price as partially a market-related function but that this function is entirely related to how much goods and services are produced and sold to other countries. This means structurally that when more goods and services are produced and sold abroad the Rand price increases and the Rand price falls when less goods and services are produced and sold outside the country's borders.

Under this conception, the demand for South African goods is not necessarily matched by how much is required by foreign countries. The Rand price is merely a market function of quantity that is produced at home and sold abroad. This conception was shared by learners across the four schools studied. Most learners wrote that: *Local goods and services produced in this country and sold to other countries increase the value or price of the Rand*'. The learners' variation lies in the demand function of the market forces. This is their object of focal awareness, that is, the extent to which demand by foreigners for South African goods and services would be met by local producers. The higher the demand for South African goods and services, the higher the Rand value/price.

Conception 4

This is the highest conception on the outcome space. In the conception learners indicated a full understanding of the topic. Unlike in the pre-test where no learner (Table 4) could achieve this level, the post-test result

showed that 15.6% of the learners total number managed to achieved this level of conception, an indication that the lessons with the new learning strategy within the variation theory of learning did improve understanding of the topic for the study. The statement of the conception from the learners and details of the analysis of this conception in terms of the phenomenographic approach are described below.

"the Rand price determination takes place on the foreign exchange market when the factors which determine supply and demand of the Rand are brought together and the supply curve meets the demand curve. The price of the Rand is at an equilibrium point where demand meets supply curve".

L20 wrote "the supply of the Rand depends on the extent to which people/businesses... wish to sell Rands in exchange for other currencies. Demand for the Rand is when importers and investors want to sell their currencies for the Rand. Another response was...the price or value of the Rand for a particular foreign currency is therefore determined when equilibrium point is reached and supply and demand curve meet and the price is determined" according to L130.

Structurally students with conception 4 started with variation in market forces, that is the simultaneous interaction between demand and supply forces will create an equilibrium point and the price or value at this point is the Rand price. According to learners who operate at this point, the Rand price is solely the function of market demand and supply forces, during trade between different countries. Referentially therefore, the learners who operated under this conception, saw the fall or rise in the Rand value or

price as purely the function of the market forces which are controlled by the supply and demand for the Rand in the foreign exchange market.

4.3.4 Summary

Four levels or hierarchy of understanding the concept of foreign exchange and the Rand price determination on the outcome space were identified. Based on the findings in this study, the different conceptions or "ways of seeing" the phenomenon of how the value or price of the South African Rand is determined on the foreign exchange market were categorised. Alongside the conceptions are their different referential and structural aspects (Thomas and Wood, 1997; Rovio-Johansson, 1999; Pang, 2002; Pang and Marton 2003; Marton and Pong, 2005), which explain what the learners discerned and focused on. The results showed that learners understanding of the concept improved after they received the new lessons based on the variation theory of learning. Through comparison between conceptions, the *critical features* of the conception were identified, namely the features that distinguish them from each other. Table 3 summarizes these findings as follows:

Table 3: Pre-test and Post-test Referential and Structural Aspects

Category (Level)	Conception	Referential aspect	Structural aspect
C	**4**	That the Rand price is determined only by market forces through the simultaneous interaction between supply and demand for the South African Rand.	Focused entirely on the market forces of supply and demand factors. The demand for the Rand is triggered by exporters (foreigners buying South African goods and services) and the supply for the Rand is triggered by importers (South Africans buying foreign goods). In each case the Rand price is determined at each equilibrium point.
B	**3**	The price or value of the Rand was conceived entirely by demand forces.	Focused on the demand side of the Rand price determination. The aspect focused on is the demand for South African goods. Variation is focused on the 'amount of goods and service South African is able to export'
A	**2**	The Minister of Finance undertakes the buying and selling of the South African currency.	The Rand price is focused on the nature of the policy. The variation is that the Government is another market force, which can intervene to determine the price
A	**1**	The learners focused on *performance* of the economy and *effect* of crime as Rand price determination.	The focus is on 'economy and crime'. The variation is that, learners see crime and the productivity levels as an influence on Rand price

4.4 Comparison between Pre-test and Post-test of Learners' Understanding of Rand Price Determination on the Foreign Exchange Market

In presenting the descriptive statistics (Tables 4 to 8) the conceptions for all learners in the pre-test and post-test were scored (Durbrow, Schaefer and Jimmerson, 2001; Gordon and Debus, 2002) as follows: In terms of this distribution (diagram 2), conceptions 0, 1 and 2 fall in outcome space A and it was given score 1. Conception 3 falls in outcome space B, and it was constituted as score 2 whilst conception 4 in outcome space C constitutes score 3. Hence the minimum score was 0 and the maximum was 3. It can be readily observed that score 1 (conceptions 1and 2, Table 4) is the most popular for written and interview tasks. Even though the learners learning experience still indicate that the majority operate at conception A, compared with the pre-test results (Table 4), their experience has improved with this Theory inspired or learning study approach (as explained below). Other relevant factors such as over crowding and other instructional support systems need to be improved to ensure the quality and level of teaching is improved as discussed in the next chapter.

The difference between the pre-test and post–test in terms of student learning outcomes was statistically calculated and the details are as follows:

Table 4: Distribution of Conceptions between Pre-test and Post-test on Rand Price Determination

Learners conception	Pre-test (200 learners)		Post-test (161 learners)	
	Frequency	Percentage	Frequency	Percentage
4	0	0%	25	15.6%
3	9	4.5%	28	17.4%
2	176	88%	108	67%
1	15	7.5%	0	0%
Total	200	100%	161	100%

Reading across the two bottom rows of Table 4 we see that most learners, both in pre-test and post-test belonged to conception 1 and 2, which give an indication that grade nine learners had not focused on the market forces as the main determinants of Rand price on the foreign exchange market. An average of 88.5% of the learners had not been able to discern and focus on the critical aspect of the supply and demand forces in the determining the Rand price or value. Nevertheless, 15.6% of the learners in the post-test group compared with 0% in the pre-test achieved a higher level of understanding of the economic phenomenon in terms of their capability to discern and focus on the critical aspect of the interaction between supply and demand forces in the foreign exchange market as the prime determinants of the Rand price or value. In terms of this result therefore, there is evidence of learning resulting from classroom application of the learning study approach within the theory of variation. Table 6 below shows that there is significant difference in learning outcomes between pre-test, and post-test after the use of variation theory. Learners in the post-test group performed much better than their counterparts in the pre-test group at .006* significant level (Table 6). Learners are said to

have shown evidence of learning if the operationalisation of the learning potential can be based on the difference in means between pre-test (.9700) and post-test (1.3168) as indicated in Table 5

Table 5: Individual School Means on Rand Price Determination, with a minimum score of 0 on the pre-test and maximum of 2 on the post-test

	N		Mean		SD	
SCHOOL	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
A	35	35	.9143	1.6286	.44533	.91026
B	72	38	.9306	1.1842	.38735	.45650
C	58	48	1.000	1.3333	.26491	.66311
D	35	40	1.0570	1.1500	.23550	.42667
Total (Composite)	200	161	.9700	1.3168	.34597	.65596

Table 5 presents the learner participants and the means cluster scores of the pre-test and post-test study. With a variance score of .213 in Table 6, the pre-test did not yield a significantly different result. In the pre-test the total number of participants was 200 learners from the four schools in the North West Province. In School A the total was 35 learners, School B had 72, School C total was 58 and School D was 38. The combined average of the four schools on their understanding of how the Rand price/value is determined on the foreign exchange market was 0.9700. The contribution per individual school to this average was as follows: School A was 0.9143; school B was 0.9306; school C was 1.000 and school D was 1.0570. The minimum score of 0 was obtained with a maximum of 2 on learner outcome space levels.

Still on Table 5, the post-test saw 161 learners participating from the same four schools. School A had 35 learners, School B had 38, School C total was 48 and School D total was 40. The combined average of the four schools on their understanding of how the Rand price/value is determined on the foreign exchange market was 1.3168, compared to that of the pre-test of 0.9700.

The contribution per individual schools to this average was as follows: School A was 1.6286; school B was 1.1842; school C was 1.333 and school D was 1.1500. Based on the levels of outcome space, the minimum score of 0 was obtained with a maximum of 3.

The topic for this study was previously taught about five weeks earlier before the pre-test by the same educators to the same learners, but through a learning strategy different from the learning study strategy within variation theory of learning, which was used for this study. The results from the pre-test showed that the learners were taught but did not understand the topic, but when the same learners were taught by the same educators through the variation theory of learning strategy, the post-test results showed a better understanding of the same topic (Tables 5 and 6). There is therefore educational significance in terms of a better way of understanding Rand price determination due to introduction of learning study within the variation theory.

Table 6: Analysis of Variance on Understanding Rand Price Determination for both Pre-test and Post-test

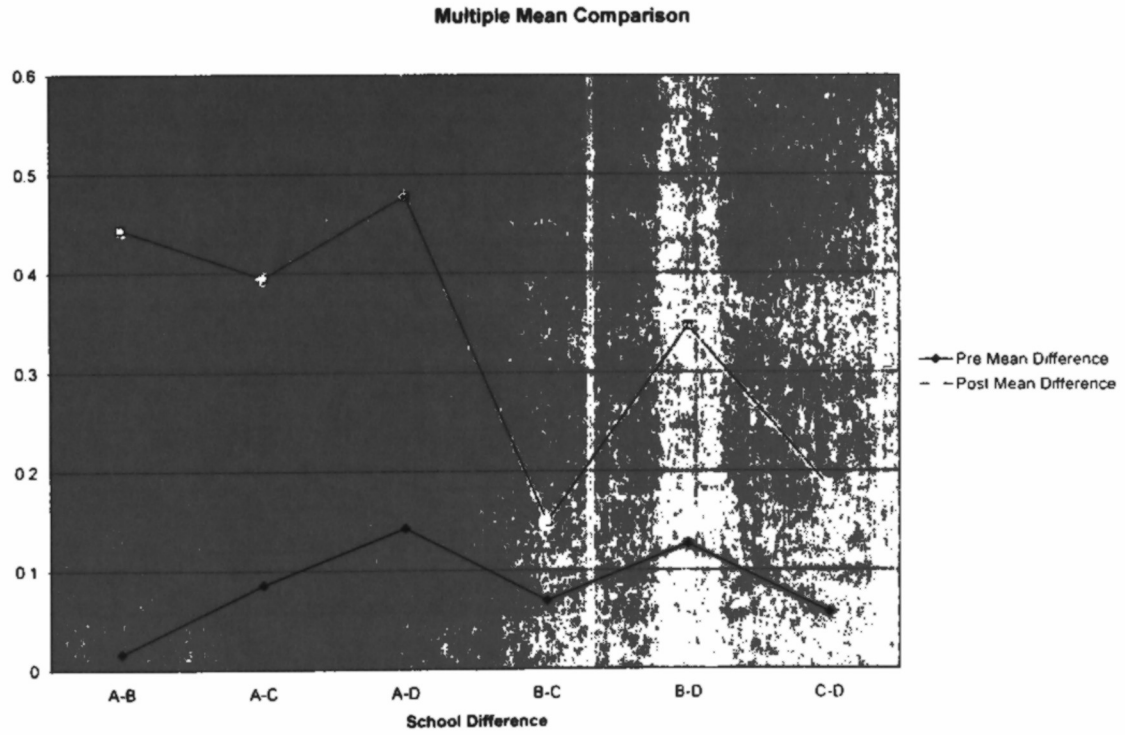
	Mean Square	F	Sig.
Pre-test	1.512	4.730	.213
Post-test	1.732	4.272	.006*

Table 6 above offers another way of looking at the statistically significant differences on the learning outcome of price determination variable. In this Table the individual schools performance can be compared. At the pre-test, learners could not explain how Rand price is determined, even though these same learners had been taught about five weeks earlier with usual or normal learning and teaching strategy by the same educators on the same topic, before they were taught the same topic again by the same educators but this time using a new and different learning strategy that is, the variation theory of learning. .

The F – statistics was applied and a ρ – value of 0.213 was obtained, showing a no significant results. This means all schools' understanding of the Rand price/value determination was the same, that is school A=B=C=D and below average performance was obtained. In the post-test results from the same Table 6, the analysis of the variance test shows a significant difference results with a ρ – value of 0.006. This illustrates that the tool, that is, application of the learning study within the variation theory, has had an impact and learners' understanding of the Rand price/value determination improved with a higher average performance. What has emerged from these Tables and Diagram is that statistically the use of the learning study within the variation theory of learning could supplement the OBE approach to improve the learning outcome of EMS concepts. The integration of the variation theory of learning which was used in this study, into classroom activities, led to improvement in learners' understanding and serves to promote one of the OBE principles, which states: "...emphasises how learners learn as well as what they learn; as their studying skills improve during their school

education, it means that they are better equipped to carry on studying at tertiary institutions and during their working lives", (DoE, 2002:4).

Diagram 4: **Multiple Comparison of Individual School Mean Differences in Conceptions of the Rand Price Determination between Pre-test and Post-test (F test)**



The above chart (Diagram 4) illustrates the results obtained from the post-hoc table. The pre-test mean differences are located around a particular region on the chart and the post-test mean differences are scattered around the chart showing that they are significantly different. Apart from the educator factor as indicated in Table 2, the mean differences among the individual schools results could be attributed to differences in location and access to learning support systems, such as library, television and radio. Two of the schools were located outside Mafikeng Area Project (APO) and therefore learners could have no easy access to library and other learning support systems such as television and radio compared to the other two schools located within the APO. The main focus was,

however, to establish the effect of the variation theory of learning on learner level of understanding of the Rand price determination and the above diagram 4 showed a general increase in the understanding of the Rand price determination.

Table 7: Multiple Comparison of Individual School Differences in Conceptions of the Rand Price Determination between Pre-test and Post-test (F- test)

Schools	Pre-test	Post-test
	Sig.	Sig.
A - B	0.819	0.003*
A - C	0.247	0.039*
A - D	0.084	0.001*
B - C	0.255	0.282
B - D	0.076	0.813
C - D	0.439	0.181
All Schools	0.213	0.006

Table 7 shows which school performed better from pre-test and post-test on post-hoc test. A multiple comparison test was performed and the Table 7 illustrates the results. The asterisks indicate that there is a statistically significant difference between the two schools.

Table 8: t-test for Equality of Means on Rand Price Determination

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig (2-tailed)	Mean Differences	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	upper
Equal Variances assumed	83.334	.000	-6.446	359	.000	-.34677	.05379	-.45256	-.24098
Equal variances not assumed			-6.063	230.395	.000	-.34677	.05719	-.45946	.23408

4.5 Conclusion

This chapter has focused on the heart of the study. Both qualitative and quantitative analyses have been exploited in analyzing the findings.

In the teaching analysis, and given the positive relationship among active involvement in teaching and commitment to implementing the learning study in full, a higher learner performance among learners in understanding how the Rand price is determined on the foreign exchange market in the post-test was expected.

Table 2 above summarized educators' activities on the enacted object of learning regarding the preparations and implementation of their lessons using the learning study approach within the theory of variation.

The teaching results showed that by creating an environment in which asking questions, using different practical examples for illustrations of concepts, varying the teaching style and strategies in bringing meaning to the level of learners' understanding and by explicitly focusing learners' attention on the shared task of improving learning the learning study method in variation theory can help create meaningful communities of learners in the classroom.

From both the qualitative and quantitative analysis, this chapter has shed light on whether or not the learning study which was the tool for treatment did yield any significant results. On the qualitative analysis, using the categories of conceptions, the results showed a significant increase in the learners' understanding of the concept (Rand price/value determination).

Whereas at the pre-test level no learner (0%) could discern the critical aspects of the object of learning, even though they had been taught the same topic using the usual learning/teaching strategy before the pre-test by the same educators to the same learners, a significant number (15.6%) were able to discern the critical aspects of the concept at the post-test level at outcome space level C, on conception 4. The application of the variation theory of learning did yield educationally significant result as indicated by Table 4.

With the quantitative analysis, the various conceptions on the Rand price determination have been computed on the score levels 0 to 3 based on the outcome space levels A to C. These were statistically analyzed, with the results between the pre-test and post-test showing a significant difference as indicated in Tables 5 and 6 above. Pre-test and post-test analysis showed a significant difference in learning outcome of the Rand price determination.

This is demonstrated using t-test at ρ- value of 0.000. This shows a statistically significant difference between the pre-test and post –test results as in Table 8. Table 5 shows that the pre-test did not yield a significant result as opposed to the post-test results of the same topic. This evidence follows when a Levene's t-test for equality of variance test is run (Table 8). The results also appear to be educationally significant in the sense that learners' knowledge of the concept improved.

Through the introduction of the learning study from the variation theory of learning, learners' understanding of the Rand price determination has increased compared to the situation at the pre-test level. Based upon these

results, a conclusion can be made that learning of the concept improved after educators introduced the learning theory in the theory of variation into the development and implementation of lessons on the topic. It is important to state that these learners who participated in this study were taught the same topic by the same educators both before pre-test and post-test but with different learning strategies. The next chapter therefore continues with final conclusions and recommendations of this study.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The main purpose for this study was to identify ways of systematically strengthening classroom practices in order to make learning possible. The key research question the study addressed was "how can educators make use of the theory of variation as a resource for making a particular kind of learning (in this case an understanding of the foreign exchange market) possible in the Economic and Management Sciences' classroom?". In the process, three specific interdependent research questions were addressed: firstly "Can we develop among learners an improved understanding of a particular topic in EMS namely; how is the price or value of the Rand determined on the Foreign Exchange market? Secondly "Does the use of learning study as a tool within the theory of variation allow learners to experience the object of learning (foreign exchange market) in a particular way?" and lastly "Can the use of a learning study help educators to improve their teaching and make a particular kind of learning possible?"

This study therefore had three main objectives: firstly to find a learning strategy or tool within the theory of variation for educators to support grade nine learners handle a rather difficult but important Economic and Management Sciences' concept; secondly to evaluate the effectiveness of a learning study within the variation theory, in the improvement of learning outcome; and lastly to establish the efficacy of the theory of variation for OBE. This chapter therefore focuses on the conclusions and recommendations.

5.2 Conclusions

5.2.1 Key Study Findings

5.2.1.1 Nature of Conceptions

The pre-test revealed three qualitatively different ways of conceptions by the learners (1 to 3) on *Rand price determination*. These were then used as the basis for the main study even though in the pre-test the analysis of the results showed that no students could manage to arrive at level C on the outcome space (Diagram 3). The post-test however revealed four qualitatively different ways of conceptions (1 to 4). The categories of description showed that the same group of learners in both the pre-test and the post-test had different conceptions or *ways of experiencing* how the price of the Rand is determined.

5.2.1.2 Outcome space

The conceptions were compared and "the critical features" of the conceptions were identified on the predetermined outcome space, and distinguished from one another. Using Pang's (2002); Pang and Marton's (2003); Marton and Pong's, (2005) referential and structural categorization, four levels of conceptions that learners discerned and focused on could be identified. Conceptions 1 and 2 fell in the lowest level (A) on the outcome space and learners failed to relate the Rand price determination to the mechanism of supply and demand factors. Learners managed to identify a single dimension of the three dimensions namely, demand or supply and

the equilibrium point. Conception 3 only showed a mention of price determination as a function of trade between two countries. The main difference between the pre-test and post-test was that none of the 200 learners who took the pre-test was able to identify conception 4 which is regarded as the most advanced because it represents a more comprehensive and sophisticated view that takes into account the interaction between supply and demand factors and the equilibrium point.

5.2.1.3 A better understanding of the topic

The next major finding was that after students were introduced to the variation theory of learning, a better understanding of the topic was demonstrated in terms of their ways of experiencing the concept or topic and learners were identified with conception 4 on outcome space level C, which could be attributed to the lessons offered based on the variation theory of learning. It should also be emphasized that these learners who participated in this study were taught the same topic by the same educators both before pre-test and post-test. The same educators in the usual course of learning/teaching and before the pre-test taught the same learners on the same topic that was used for the study. After the pre-test the same learners were taught again by same educators on the same topic but this time a new learning strategy – the variation theory of learning was integrated into the new lessons.

Given the lessons based on theory of variation of learning, about 15.6% (Table 4) of the learners held conception 4, in other words, these learners considered Rand price/value determination as a function of the interaction between supply and demand at the equilibrium point. In comparison with

the same learners at the pre-test, none of them reached this level of understanding. Furthermore, about 17.4% of the learners in the post-test group acquired conception 3 compared with 4.5% of the same learners on the pre-test group, who were identified with conception 3 on outcome space level B. The post-test results showed that the study brought about a better understanding of the topic.

5.2.1.4 Inter and Intra group differences in Object of learning

Another finding relates to differences in conceptions among inter and intra groups. For instance, the mean difference between schools at pre-test level and post-test level indicates that there was better understanding of the topic in each school, after the new lessons phenomenography and the theory of variation of learning. The differences in learners' performance appear to coincide with the differences in the pattern of variation made available in each school and reported by learners during the written and interview tasks. For example, in school A the educator allowed more flexibility for learners to express themselves, ask questions and allowed more learner presentations thereby introducing simultaneous variation in both supply and demand analysis throughout the lessons. In contrast in school D the educator did not allow as much flexibility for learners to manifest simultaneous variation, and did not allow much flexibility for learners in the form of group discussion, co-operative learning and presentations, and did not keep to the invariant examples for the last session. It was later established that learners taught by school educator A achieved better understanding than the learners taught by educator D which might have been associated with the pattern of variation made available in the new lessons. A closer look at the mean value of the

conceptions showed that school D achieved a mean of 1.1500, whilst school A scored a mean of 1.6286 (Table 5). The mean differences among the individual school's results could also be attributed to differences in location and access to learning support systems, such as library, television and radio. Two of the schools were located outside Mafikeng Area Project (APO) and therefore it could be said that learners had no easy access to library and other learning support systems such as television and radio compared to the other two schools located with in APO.

5.3 Recommendations

Based on the findings of this study the following recommendations are made.

5.3.1 Infusing Learning study into classroom Practices

This study is recommending that the learning study strategy should be infused into classroom practices. One of the key objectives of this study was to establish the efficacy of the theory of variation of learning for OBE, hence the key question was to find out if the use of learning study could help educators to improve the teaching and make a particular kind of learning possible in EMS. With the use of the learning study tool within the theory of variation of learning, the study established that educators could improve the understanding of how the Rand price is determined on the foreign exchange market. As the study finding has demonstrated in Chapter Four, a conclusion could be made from the study that a learning methodology, that is, the theory of variation of learning, could be used to

improve learning with particular reference to EMS on the concept of the determination of the Rand price in the foreign exchange market.

An educator in school A was quoted as saying *".....there was a bit understanding by the learner in the learning study..... Unlike the OBE method where the learner is only left to explore for the answers most of the time."* In School C the educator commented as follows: *"...in the learning study learners become more participatory, active and get more contact with the educator in his/her guidance, the use of more examples to illustrate points create variety of variations in seeing the same concept from different angles, thereby creating better understanding of the concept."* This study therefore supports the role of the theory of variation, which is that learning to see something in a particular way is a function of experiencing simultaneous variation in critical aspects of the object of learning. Hence, the integrating of the learning study within the variation theory of learning into classroom activities is strongly recommended.

5.3.2 Integrating the theory of variation of learning into OBE approaches

On the whole, the theory of variation in the case of this study was a useful resource for educators to make learning possible, and that it could be a useful resource which brings about learning. Research has shown that the level of trust in the class increases as learners express their questions and doubts without any repercussions (Cottel, 1991). One of the principles of Outcomes-Based Education is the development of an effective educational community, which actively involves learners in the learning process. In this current situation in the history of South Africa and with the background of

both pre- and post- apartheid education as explained in chapter 4, where all stakeholders are seriously trying to find a better way to ensure effective learning, especially in the public schools, the patterns of variation, based on the improved learning results from this study, can be seen as a methodological innovation

The main underlying strategy of the NCS which saw its introduction into High Schools for the first time in 2006 was, among other things, to enable educators to create an environment in which asking questions and voicing confusions is not only safe but valued – and by explicitly focusing learners' attention on the shared task of improving learning. Besides, the South African Government has always felt the need to improve the Matric pass rate, especially the university exemption rate and it has realized that one way to do this is to improve upon the present quality of learning and teaching through Outcomes-Based Education.

When learners get used to the idea that they must express things about which they are unclear, they focus more on their learning processes. Teaching should attempt to reveal each learner's awareness, understanding and control of his or her own learning process. It is the educator who needs to identify the critical aspects related to different ways of understanding of a particular object of learning, and design the pattern of variation, or create the space of variation *consciously* with respect to these critical aspects. In other words, even with the presence of the necessary space of variation, one can only say that learning might take place and it is hoped learners *might* have a better chance of achieving the object of learning effectively. The object of learning is thus conceived to be more than a collection of concepts within the structure of an academic

discipline, more than the educator-learner relationship, and also more than the educator's instructional method or knowledge of the content. Rather it is a human-world relationship between the educator, the learner and what is to be learnt, which constitute a triadic relationship at the heart of which is the object of learning. The learning study would therefore enhance the OBE approach as practised in the South African educational milieu by integrating the principles of learning study within the variation theory of learning into classroom activities as outlined in chapter 3 page 122, of this report.

5.3.2 Strategy for Teacher Education

This study is recommending the inclusion of the learning study within the variation theory as a methodology within the repertoire of learning and teaching techniques that can be used to improve educator and learner understanding of EMS concepts.

In-service activities for EMS educators have seen an increase since 1998 when the Outcomes-Based Education was first introduced. For example, in consultation with the Subject Advisory Services of the NorthWest Provincial Department of Education, from 2002 to 2005, each school had presented at least one educator for EMS workshop. However interviews with schools and Subject Advisors and other EMS educators revealed that these educators sent for in-service workshops were not qualified in any of EMS related subjects. The successes or otherwise of these workshops need to be evaluated, nevertheless, the fact that EMS learners still continue to experience difficulties, as exposed in the General Certificate for Education and Training (GCET) assessments for grade nine learners, imply that these training workshops should be strengthened.

A learning study within the variation theory of learning can help educators to improve their practice and make learning possible, and on the other hand, it can help to develop further the theory of variation and the way in which learning is understood. The findings from this study provided the evidence (as shown in chapter 4) that the use of variation theory led to improvement in quality of learning as reflected in the improvement of conception 4, page 157 and as shown in Tables 4, 5, 6 and 8.

This study, which applied the theory of variation, a learning theory, has added to the repertoire of pedagogy, the pedagogy of variation in the South African teacher education programme. However in terms of professional development it would be appropriate to state that the theory of variation at this juncture would afford educators the opportunity to learn from investigating their classroom practices, that is, from how they deal with the objects of learning in order to improve teaching and learning. "Professional learning for teachers takes place when they can see their efforts result in improved learning", (Pang, 2002:186). This study should therefore become one of the learning strategies to form part of the teacher development programmes.

5.3.4 Suggestions for Further studies

This study also recommends a follow up study throughout South Africa which would encompass many schools and also extend over a longer period to measure the real extent of the application of learning study as way to enhance OBE and specifically, encourage effective learning. This recommendation is based on the fact that the present study has been

limited in scope in terms of its generalization of the results for all non participating schools.

However based on the findings, the study suggests the following issues for further research:

- Theory of variation should be further investigated using a bigger sample of schools and compared with other strategies of learning in EMS. An experimental research is necessary to establish the effectiveness of this learning study approach with other strategies of learning.
- Further studies focusing on the participant educators' perceptions of this strategy as compared with other strategies in use.
- Other learning areas specifically, Social Sciences, Technology and Natural Sciences could also replicate this study on the theory of variation because there is much less understanding among learners with these learning areas' content as shown by small number of learners who take these subjects in High Schools.

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APPENDIX A

INSTRUMENTS

Lesson plans – Learning Study

Specific Outcomes:

After the series of lessons, learners should be able to discern the critical features of the concept:

1 The demand for the South African Rand.

2 The factors that influence the demand of the South African Rand

3 The supply of the South African Rand

4 The factors that influence the supply of the South African Rand

5 The Determination of the Price or Value of the South African Rand

6 Factors which influence the Rand price.

Learners' Prior Knowledge:

Learners have already learnt the topics: "price equilibrium for goods and services", "money", "products and services"; "free market economy", "sectors of the economy".

Lesson 1: Theme – Foreign Exchange - Introduction.

Performance Indicators:

After the lessons, learners should be able to:

1 describe the foreign exchange concept
2 explain and identify foreign exchange market
3 explain what is meant by 'demand for foreign exchange'.

Educator Activity	Learner Activity	Comment
Activity 1 (15 minutes) ▪ Ask learners to share their experiences, if any, on different currencies they have come across apart from the Rand. Ask learners the purpose of having a currency in a country.	Learners share their experience of different currencies and give explanation for the purpose of having a currency in an economy. Provide practical examples of different currencies if possible, such as the Botswana Pula, US Dollars, Zimbabwean Dollar, etc.	To reveal the variations in learners' ways of understanding currency of a particular country. To explore the role currency plays in the context of economic goods and services. To provide relevant structure for students to learn this economic concept: learners get a more considered view on currency types and role they play. Interactive learning process could assist learners to experience the learning process and create meaning.
The teacher shares his own experience of different currencies of the world ▪ Identify examples of goods and services traded between South Africa, Nigeria, the United States and the UK. Identify each country's currency with which Dlamini is involved and show how the goods and services are paid for.	Learners participate throughout the activity through interactive learning process. Learners engage in discussions on the need for Dlamini to obtain the foreign currencies in order to pay for the goods bought and sold to Nigeria, United States or the UK.	Learners create meaning for foreign exchange market. That is the process of exchanging one currency for another.

Educator Activity	Learner Activity	Comment
Activity 2 (20 minutes) ▪ Introduce the concept of foreign exchange. Use for example Mr Dlamini who owns import-export business and is engaged in buying and selling to other countries. (See attached case study). Use a scenario of a trade pact between South Africa and the UK and establish how goods and services are traded between the two countries. Establish the need for payment and ask students to explain why the British would like to be paid in pounds and not Rands if they sell goods to South African businesses and vice-versa.	Learners take home the task of identifying the currencies of the main trading partners of South Africa and determine how much in terms of Rand for each unit of currency per country. Learners compile a list of currencies for the following countries from library through newspapers, watching television or, radio news, ask from parents, relatives, friends or any person. Swaziland, France, Italy, Ghana, Kenya, Canada, Mexico, Egypt, Saudi Arabia, Germany, Netherlands, Iran, India, Pakistan, Brazil, Jamaica, Nigeria, Belgium,	Learners create meaning for exchange rate. That is the process of identifying each country's currency and its equivalent in Rand term per unit.

Lesson 2: Theme – Foreign Exchange Market and the Demand for the Rand

Performance Indicators:

After the lesson, learners should be able to:

1 Demonstrate an understanding of the concept 'foreign exchange market'
2 Explain the demand for currency within the context of economic goods and services.
3 Identify factors which influence the demand for a currency.

Teacher activity	*Learner activity*	*Comment*
Activity 1 (10 minutes)		
▪ Recap the elements of currency and foreign exchange, using practical examples from the South African Rand and those they have identified from the previous homework.	Verbalise the answers using everyday language and technical language. Explore where foreign exchange markets can be found. Verbalise their answers	To address students conception on foreign exchange market
▪ Refer to international trade mechanism and discuss the market for currency as mechanism to facilitate the payment for goods and services between countries. How can the UK obtain Rands to pay for goods ordered from South Africa and vice – versa, i.e. South Africans to pay for goods bought from the UK?.	What purpose does foreign exchange market serve? Learners reflect on how the Rand could be used to pay for Goods exported or bought by Dlamini from the USA, UK and France. At the same time learners reflect how someone in Ghana or Mexico could pay for goods sent from South Africa?	To introduce different modes of representation. To address students conception on foreign exchange market

Educator Activity	*learner Activity*	*Comment*
Activity 2 (20) ▪ Explain the concept of market mechanism and ask why it is called a market; what brings their minds to the concept of a market? How is price determined on a market in a free –market system for products and services?	Learners express their views on market mechanism using their experience in price-mechanism for ordinary goods and services.	To address learners' understanding which should focus on market mechanism for goods and services
▪ Refer to the South African Rand, for example and ask what is meant by the demand for the Rand. Using the demand curve scenario, explain how the price of the Rand varies on the curve as a result of changes in demanded. ▪ Ask students what may influence the change in the demand for the Rand?	Learners participate in determining the price/value of the Rand along the demand curve. Using group learning strategy, learners explore the factors which might cause the quantity demand for the currency to change along the demand curve .	To introduce variation in the aspects of the relationship between price and quantity demanded of the currency. To explore the learners understanding of 'demand' as a critical aspect of the determination of the value or price of the Rand. .
Activity 3 (3 minutes) Wrap up with questions for students to think about: investigate whether demand alone is sufficient to determine the Rand price	Learners carefully note the following: o Do you think a demand for South African Rand by an importer in Nigerian alone could determine the price or value of the Rand?	To explore students critical understanding of the value of the Rand. The Nigerian demand for the Rand could not by itself determine the price of the Rand. Learners who say yes would be considering only the one aspect of the price mechanism.

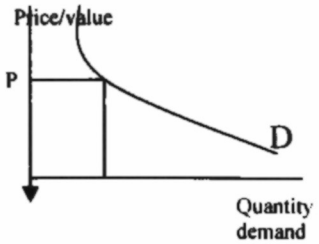
Educator Activity	*Learner Activity*	*Comment*
	○ The sum total of all exports from South Africa will determine the value/price of the South African Rand. Do you agree with this statement and why?	Learners need not agree with the second question either, because such agreement on Rand price determination would only become one referential aspect of the concept of exchange rate and it ignores the critical aspect of the foreign exchange market mechanism.

Lesson 3: Theme – Supply side of the Rand and the Market price of the Rand

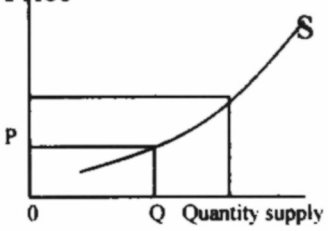
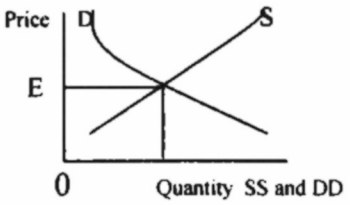
Performance Indicators:

After the lesson, learners should be able to:

1 Demonstrate their understanding of supply side of the Rand.
2 Explore the factors which influence the supply of the Rand within the context of economic goods and services.
3 Demonstrate an understanding of the market price of the Rand in the context of economic goods and services.

Teacher Activity	*Learner Activity*	*Comment*
Activity 1 (5 minutes) ▪ Recap the elements of the foreign exchange market and the demand side of the Rand. Ask students to describe these elements, as they understand them.	Verbalise the answers using everyday language and technical language. For example, 'demand for currency is generated by foreigners who want to buy exports. The cheaper the currency (that is the lower the exchange rate), the cheaper exports will be, and more currency will be demanded. So the demand curve will slope downwards just like price mechanism demand curve and as shown by the diagram below:  	To establish the critical aspects of their understanding of these elements.

Teacher Activity	*Learner Activity*	*Comment*
Activity 2 (20) lesson 3 ▪ Recap the concept of foreign exchange market and ask why it is called a market; what brings their minds to the concept of a market? How is price determined on a market in a free –market system for products and services? ▪ Refer to the South African Rand, for example, and ask what is meant by the supply of the Rand Using the supply curve scenario, explain how the price of the Rand varies as a result of changes in supply of the currency ▪ Ask students what may influence the change in the quantity supply for the Rand	Establish the concept of a market in technical language. For example, Foreign exchange market is a system or an arena where exchange of currencies takes place. A price for goods and services is determined by the interaction of market forces of demand and supply in a free market economy. Use diagrams/graph to explain the concepts, verbalise the answers in everyday language and technical language. For example, people (including Dlamini) wanting to buy imports supply currency when they buy foreign exchange. The higher the exchange rate, the more foreign exchange their funds will buy, the more imports they can get, the more currency will be supplied. So the supply curves slopes upwards, just like the normal supply curve for goods and services, as shown below.	To address learners' understanding which should focus on market mechanism for a commodity? To introduce variation in the aspects of the relationship between price and quantity supplied of the currency. To explore the students understanding of 'supply' as a critical aspect of the determination of the value or price of the Rand

Teacher Activity	*Learner Activity*	*Comment*
	Price  The supply of Rand, for example, depends on the extent to which people, business establishments and Governments wish to sell Rand in exchange for other currencies. The sellers will include South African importers, and investors in foreign firms. For example, South African businesses like the mining companies would like to buy mining equipment from Canada. Edgars will also buy clothing from China. Old Mutual will also want to acquire shares in a company in Sweden and MTN would like to buy into Nigerian Telecommunications	
ACTIVITY 3 ***lesson 3*** **(10minutes)** ▪ Integrate supply and demand curves together and ask students to describe the interaction between supply, demand and the price of the Rand	 Rand price is determined by interaction between supply and demand forces on the foreign exchange market as shown above. The equilibrium value/price of the Rand is at E and this is also known as the *exchange rate.*	To discern dimensions of variation in the aspects of the relationship between supply and demand To determine the extent to which students are able to discern the critical aspects of the determination of the Rand Price.

Teacher activity	*Learner Activity*	*Comment*
For their homework, learners are asked to construct their own meaning on how the value of the Rand is determined on the foreign exchange market.	Learners do the following homework: Read the attached case study on investments to and from South Africa and answer the following questions: ▪ Draw a supply and demand diagram showing the demand for the Rand from foreign investors, and the supply of Rands coming from South African investors overseas. Indicate the price of the Rand or the exchange rate, and the quantity of the currency. Draw the equilibrium exchange rate. ▪ What choices do exporters have about their prices when the exchange rate goes down? ▪ What would you expect to happen to firms specialising in importing, after a Rand depreciation? Explain your answer.	To determine the extent to which students are able to discern the critical aspects of the determination of the Rand Price.

APPENDIX B

INTERVIEW INSTRUMENTS

Educators' Interview schedule

How do you feel the lessons worked out?

Did the lessons go as you planned? If not, why?

Did the learners focus on the critical features of the concept?

Which part of the lessons do you think contributed most to learners' learning of the critical features of the concept?

Did the learners seem to have any particular difficulties?

How are these lessons different from the way you usually teach?

If you teach these lessons again, would you use the same approach? Give reasons. How would you vary?

What are your views about the theory of variation? (only to the theory-inspired group?)

How does this theory relate to Outcomes-Based Education theory?

Is there anything else you would like to mention?

Source: adapted from Pang, 2002

Learners' interview schedule

Having attended the lessons about foreign exchange, what are the important points that you can remember?

Describe how the educator helps you to find out these points in question 1

Which part of the lesson do you think contributed most to your learning of the concepts?

With reference to the lessons, is there any difference between these lessons and the normal lesson presentations by the educator?

Which teaching style do you prefer? This new one or the original one?

Do you have any particular difficulties in grasping the concepts?

Source: *adapted from Pang, 2002*

C Performance Indicators (Specific questions)

Explain verbally your answer to the written task

Describe in your own words how the price of the Rand is determined on the foreign exchange market?

Study the attached case study on foreign exchange and answer the following questions:

Explain how the demand for the Rand can increase or decrease along the demand curve

Discuss economic changes resulting from:

a) Higher Rand value,

b) Lower Rand value,

Compare the relationship between:

a) Demand for and the supply of the Rand;

b) Quantity demand and Quantity supply of the Rand;

c) A shift in the demand and supply curves and the value of the Rand.

SOURCE: *Performance Indicators (from Department of Education Policy Document, EMS Senior phase 1998).*