

EXPLORING LEARNER UNDERSTANDING OF ECONOMIC AND MANAGEMENT SCIENCES' (EMS) CONCEPTS THROUGH VARIATION OF LEARNING THEORY: CLASSROOM EXPERIENCES

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Abstract

This paper addresses one of the fundamental issues in learning and the strategy for enhancing learning within the context of outcomes-based education. The paper argues that the Theory of Variation (ToV), within the phenomenographic paradigm, could be used as a classroom resource to enhance learning particularly in Economic and Management Sciences' (EMS) education. The article discusses the results of how the understanding of value/price determination of the South African currency (the Rand) among grade 9 (15-16 year olds) was enhanced using the variation theory of learning approach within the phenomenographic studies as a classroom resource. The notions of conceptions, outcome space and object of learning, are found to be key aspects in ToV as a classroom resource. Using these notions, the article analyses the effect of ToV integration into EMS classroom learning activities. It also argues that the use of ToV as learning support strategy significantly enhanced the quality of learning. ToV approach could, therefore, supplement the simplistic outcomes-based learning schemes that overly simplify the outcomes and products of learning and which have received much criticism of late in South Africa.

Key words: *conception(s), Economics and Management Sciences (EMS), object of learning, outcomes-based education, outcome space, phenomenography, South Africa, variation of learning (ToV).*

Introduction

The conceptual framework is analysed using the key concepts which are grounded within the context of the variation theory. These key concepts provide the epistemological and methodological paradigm in which the Variation of Learning (ToV) study is grounded. For the second part the article outlines the plan, execution and results of the study within ToV. With the introduction of outcomes-based education (OBE) in South Africa in 1998 (DoE, 1997), it can be concluded that there has been a shift from the use of the term 'teaching and learning' to 'learning and teaching' because of the change in the relationship between educators and learners and the manner in which teaching and learning and its assessment are transacted (Jephcote and Abbot, 2005). The OBE approach signifies the move from the teacher-led transmission mode of teaching methodology to a student-centred, interactive and participatory style of learning as well as to a more inclusive notion of assessment. This article is an attempt to contribute toward the search for a 'new way of experiencing learning and teaching' within OBE. This study therefore explores ways to increase learner participation and understanding of EMS. It also tries to provide a basis for improving teacher education in EMS in line with outcomes-based education goals. In order to obtain support for this proposition from empirical work, the present study used the theory of variation to design instructions in economic and management sciences lessons for secondary school learners in grade nine (15-16 years), by helping the learners to develop certain ways of experiencing an economic phenomenon, viz how the Rand price is

determined on the foreign exchange market. The topic was chosen because of its relevance to that phase level and also a generally interesting economic phenomenon in the country. The choice of grade 9 was based on the fact that all the four educators who assisted with this study and who were familiar with this learning approach happened to be teaching grade nine at the time of the study. In addition, the educators and the researcher were all subject specialists in EMS. The article first explores the theoretical framework for the study, and this is followed by the discussion of the classroom experiences.

The Conceptual Framework of the Study

The conceptual framework outlines aspects of the ToV concepts within the phenomenography in which this study was grounded. The conceptual framework has been selected because it specified the context in which the researcher and the educators went by to select the topic (*object of learning*), develop the lessons (*intended object of learning and the learning study*) and evaluated the learners' individual learning outcomes (*conceptions*) as well as the presentation of the learning results (*outcome space*). The conceptual framework also provides examples of other related research studies which were grounded in phenomenographic studies and which related to the content of this article. In essence the conceptual framework attempts to locate this study within its theoretical perspective, viz the phenomenographic paradigm in general and ToV specifically.

Phenomenography and the Variation Theory of Learning

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 particularly in economics and management sciences including accounting education. 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, 2002). Phenomenography thus evolved as a research specialisation aimed at "describing conceptions of the world around us" (Marton, 1981). Fundamental to the understanding of the phenomenographic approach is 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 & Pang, 1999). The purpose of using a phenomenographic approach for this study was to provide the learners opportunity to describe qualitatively different ways of experiencing phenomena. The implication here is that learning outcomes should not be just quantitatively measured and evaluated but that each learner's response should be assessed using the conceptions and outcome space context (see below). This approach would add to the OBE principle which, among others: "...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). Using the ToV would enable educators to identify the qualitative experiences of learners about objects of learning on which individual or group learning support could be provided where necessary.

The recurring principle in phenomenographic investigations is: whatever phenomenon or situation people encounter, a limited number of qualitatively different and logically interrelated ways in which the phenomenon or the situation is experienced or understood can be identified. According to Trigwell, Prosser and Ginns (2005), 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. The object of research in phenomenography is variation in ways of

experiencing different phenomena. The 'first face of variation' refers to the study of variation between different ways of experiencing the same phenomenon, wherein the categories of descriptions and outcome space are instrumental to characterising how learners experienced the phenomenon, that is, the Rand value/price determination as shown under the results of the study. Most studies in this line of research would pose the question as "what are the different ways of experiencing the phenomenon?" 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 (2000), is in descriptions of the qualitative variation in the way a student's object of study is understood. How grade 9 learners described the Rand price/value determination has been presented using the phenomenographic approach under 'the results of the study'.

The view of phenomenography is that learning is a matter of seeing, or experiencing something in a new way. In phenomenographic perspective, learning occurs when the learner is able to identify the critical aspects of the objects and situations and the focus is on them simultaneously (Wood, 2006). Variation theory of learning is a theoretical approach that can be used to describe what is required for learning to occur. These include the combination of the *intended*, *enacted* and the *lived* objects of learning (see 'object of learning'). According to Linder & Marshall (2003), learning cannot take place without discernment, while discernment cannot take place without variation. Using variation theory means "trying alternative ways of understanding" (Marton, Asplund-Carlsson & Halász, 1992:10) a phenomenon and making explicit the implications of ways of understanding the whole phenomenon or parts of it. In this study, the researcher and a group of educators utilised the variation theory of learning to enhance learner understanding of the foreign exchange. In this regard, lessons were developed and presented in line with the variation principle as described above in an attempt to enhance learner understanding of phenomena.

The variation theory of learning occurs 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 teaching methods. Pang (2002); Pang and Marton, (2003) call this strategy 'the learning study'. One of the principles of variation of learning approach is that the educator should not 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. Variation theory proposes that in order to discern such critical features it is a great advantage if one experiences patterns of variation that distinctly help make those features noticeable. If such a pattern of variation carries a design that has some features being kept invariant while others are varied, then the learning advantage becomes distinctive (Carstensen & Bernhard, 2009). Successful learning is underpinned by probing into learners' own interests and by motivating learners through interesting, challenging and relevant activities (Jephcote and Abbot, 2005). This approach differs from the normal structured approach which lends itself to tight educator control and prescription where an overall purpose is to get learners to come to the same understanding. In the current education dispensation, learners are no longer prepared and willing to be treated as passive partners in the learning-teaching process. Thus outcomes-based education and ToV have much in common in promoting learner centred education. In order to understand the integration of ToV in classroom practices, it is important that certain specific concepts that are used to describe the learning process in phenomenography are highlighted. These concepts also constituted the theoretical framework for the content of this article.

Conception(s), Outcome Space and Object of Learning in Phenomenography

The foregoing discussions relate to the various terminologies and concepts used in

phenomenographic studies and which constitute the point of departure from which the variation approach has been used as classroom resource to enhance the understanding of this particular EMS phenomenon which constitutes the object of study for this article.

Object of Learning

An integral epistemological viewpoint that underpins the variation perspective on learning is the notion of an “object of learning”; that in order for learning to take place there must be a “something” to be learnt, and this “something” is what is referred to at the “object of learning”. Then there is also “conception” which is a unit of description in Phenomenography (Marton & Pong, 2005) and refers to different ways of experiencing or understanding a particular phenomenon. In this study learner’ conceptions of how the Rand price/value is determined on the foreign exchange market have been presented under pre-test and post-test analysis respectively. A conception is made up of two aspects (Pang, 2002; Marton & Pong, 2005):

- the *referential* aspect, which refers to the global generally accepted meaning of the object or phenomenon conceptualised (for example, the Rand price/value is determined on the foreign exchange market through the interaction of demand and supply mechanism); and
- the *structural* aspect, which shows the specific combination of features that have been discerned and focused (understood) upon by the learners (for example the Rand price/value is determined by international trade as discerned by some learners in this study).

A feature of an object or phenomenon, according to Marton & 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 description of conceptions on particular phenomenon, namely *how the Rand price/value 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*.

Outcome Space

An Outcome space is a representation in the form of categories of descriptions or ways of experiencing the phenomenon referred to as *conceptions*, which are further analysed with regard to their adequacy and logical relations (Marton & Pong, 2005). According to Åkerlind (2005), outcomes are represented analytically as a number of qualitatively different ways of experiencing the phenomenon, but also including the structural relationships linking these different ways of experiencing (for example, in analysing learners’ classroom experiences on Rand price/value determination in the pre-test and post-test results, the various conceptions as discerned by the learners were categorised into hierarchical order in terms of referral and structural meanings assigned (Table 3). 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 (see Diagram 1 below) on which the various conceptions for both pre-test and post-test results were locally categorised and analysed based on their hierarchical structural relationships.

Learning and Teaching Metaphor in Variation of Learning within Phenomenography

The theoretical descriptions mentioned above are grounded in empirical research on learning. These theoretical descriptions are used for analysing learning as well as teaching. To investigate the teaching of *foreign exchange market* from the described theoretical perspective, implies an analysis of how the 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.

The foregoing metaphor provides background analysis of how and where phenomenographic studies have been conducted which have bearing on this study. Effective learning and teaching in an Economic and Management Sciences (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 & Abbott, 2005:64). 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 phenomena in one’s awareness. According to Marton & 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 & Marton (1998) are of the opinion that people can build up their competence in seeing, that is, understanding the world to deal with new situations in the future. Bowden and Marton (1998:35) point out that discernment “is a defining feature of learning in the sense of learning to experience something in a certain way”. 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. In this article, learning is constituted as the attempt to change the way learners experience a particular economic phenomenon, which is the determination of Rand value/price on the foreign exchange market through the variation of learning approach. According to Runesson (1999), when teachers are studied in action, when they communicate 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’ (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 question as well as for the teacher to be totally clear about what it is he/she is asking both of his/her subjects and his/her data.

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 (Alexandersson, 1994, Andersson & Lawenius, 1983; Annerstedt, 1991) based primary on interviews have given accounts of which aspects of the teaching situation that are in

teachers' focal awareness. From these studies it can be concluded that teachers, when in an interview are asked to talk about their teaching, 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 comes into play here.

In her study to establish the different ways in which teachers deal with 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 are presented presupposed a way of experiencing them. In a teaching situation, the teacher must be able to discern critical aspects of the content and critical aspects of pupils' learning simultaneously and this must be done against a background of an experienced variation of the aspects. Teachers' level of understanding of the subject matter greatly influences the critical aspects of the phenomenon which learners are able to discern. It is therefore important that the issue of discipline content deficiency among EMS is addressed urgently for effective facilitation of learning outcome.

In conclusion, it can be stated that learning and teaching are very complex phenomena. Teaching has more dimensions 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 & 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. The research methodology as discussed below provides a brief summary on how the variation of learning principle was used to establish the different ways of experiencing the determination of Rand price on the foreign exchange market.

Methodology of Research

This study is described as a case study in the sense that learners' experiences of a particular phenomenon and the learning experiences that they encountered with the phenomenon over a particular period of instructional time, using different learning study approaches 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 those used to illustrate problems or indicate good practices. Case study is therefore appropriate to explore alternative meanings and interpretations within phenomenography. The main purpose of the study was to identify ways of systematically strengthening classroom practices in order to make learning possible.

The variation approach was utilised in part to determine the nature of qualitative change in learning outcome. 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 five 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 (the variation of learning approach) within phenomenography as discussed, to enhance the understanding of the same topic among the same learners as demonstrated by the post-test results.

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 below. 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 within the phenomenography in general (Corte, Verschaffel and Van De Ven, 2001; Pang, 2002). According to Pong (1999) and Pang (2002), the use of variation approach has two aims similar to outcomes-based education principles: firstly, to build innovative learning environments whereby both teachers and learners continuously explore alternative ways to enhance classroom activities and to conduct research studies of theoretically grounded innovations; secondly, to pool educators' valuable experiences in one or a series of research lessons to improve teaching and learning. In this case, learning and teaching is seen as a collaborative effort. In fact the primary focus is, however, on the object of learning, not teaching methods. Variation can be used to enhance educators' pedagogical capabilities and professional development (Pang, 2002). In documenting the experiences which educators have gained during the professional training and/or in-service training as well as updating workshops, 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. Details of the study process are further explained below.

Study Procedures

Four EMS educators from four different schools within NorthWest Province participated in the main study. The educators and researcher discussed (during three preparatory meetings), 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 one joint learning programme on foreign exchange market that contained 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. Table 1 below provides details of the respondents.

Table 1. Respondents.*

Schools surveyed	N Grade 9 EMS learners	
	Pre-test	Post-test
A	35	35
B	72	58
C	58	48
D	35	35
Total learners who participated	200	176

*N = total population in the study

These represented the grade 9 (14-15) learners who participated in the study per school. After the presentation of the three lessons, learners' understanding of the topic concerned was evaluated. **The learning process within the variation principle in the classroom activities** included creating an environment in which asking questions, using different practical examples for illustration of concepts, varying the teaching style and strategies in bringing meaning to level of learners' understanding as well as voicing confusions that are not only safe but valued. The learning process also required educators to deliberately bring learners' attention on the shared task of improving learning in order to create meaningful communities of learners in the classroom. It was a human-world relationship between the educator, the learner and what was to be learnt, which constitute a triadic relationship at the heart of which was the object of learning. All learners were required to complete a written task and three learners from each school were chosen randomly for interview. Based on the data obtained on the teaching and

learning, inter school comparisons were conducted to explore qualitative differences in the ways that the educators handled the same object of learning, and the learners' qualitatively different ways of making sense of the phenomenon in question (Pang, 2002). The researcher and the educators then explored the objects of learning as follows:

The Intended Objects of Learning for the Lessons

As explained earlier on, the intended object of learning was the learning programme which consisted of the foreign exchange market. The educators and the researcher agreed, after the pre-test, to identify certain aspects of the phenomenon in which learners had made common mistakes. They identified for example:

- the concept of foreign exchange markets 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.

It was agreed that these technical aspects are 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 Enacted Object of Learning

The enacted object of learning, therefore, comprised the combined instructional and classroom activities which were intended to enhance the structural meaning of the phenomenon. The learning programme served to demonstrate the intended object of learning, but it is the enacted object of learning, which 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 or not hinged on a number of contingencies such as the immediate feedback of the learners, the understanding of the learning programme by the educators, language of instruction, learners' predisposition and time table, to mention but a few. 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.

Results of the Research

The object of research in phenomenography is 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 phenomenon, wherein the categories of description and outcome space are instrumental to characterising how people experience reality (Pang, 2003). Most studies in this line of research would pose the question as "what are the different ways of experiencing the phenomenon?" The following analysis of the pre-test and post-test results showed the different ways in which the grade 9 learners experienced variation of understanding

in the Rand value/price determination before and after learning and teaching.

The Outcome Space (Hierarchy of Learning)

In this study, the agreed object of learning was to help learners to develop an economic understanding of the *determination of Rand value/price on the foreign exchange market (the structural aspect)*, by making use of the notion of the market supply and demand forces. In terms of the learners' responses to the written and the interview 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

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* (predetermined levels or categories of descriptions or ways of experiencing the phenomenon referred to as *conceptions*,) derived for the phenomenon and grounded within the phenomenographic paradigm. These predetermined three levels, A to C in this case and as represented in Diagram 1 below helped to establish the outcome space in which learners who went through this study could be categorized according to their logical inclusiveness and adequacy. The more dimensions of variations to be taken into consideration simultaneously, the higher the level of the conception would be in the hierarchy of the outcome space (Pong, 1999; Marton and Booth, 1997; Pang, 2002; Pang and Marton, 2003).

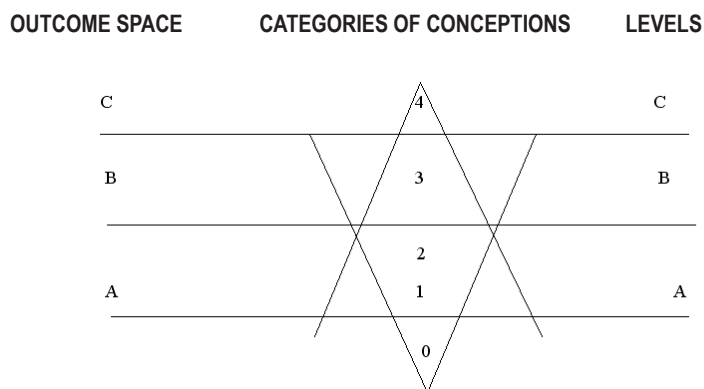


Figure 1: Outcome Space for Levels of Conceptions of How Rand Price/Value is Determined on the Foreign Exchange Market.

Three levels, A to C, where C is the highest and A the lowest within the outcome space in which learners' conceptions were placed, were predetermined. These predetermined three levels, A to C as represented in Diagram 1 above, helped to establish the outcome space in which learners at this level could be categorized according to their logical inclusiveness and adequacy.

The following is the analysis of the *conceptions* (different ways of experiencing or understanding) of the Rand price/value determination indicated by learners after the pretest and

post test.

Conception 1. *If the economy is doing well and if there is no crime then the price of the Rand is fixed or determined*

This conception was shared by 7.5% of learners who took the pre-test. Nobody held this conception at the post-test and after the introduction of the variation theory into the classroom activities. The statements made by the respondents in this category represent how these learners understood the Rand price determination. This conception was not found during the post-test. 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”*.

Conception 2.

(pre-test) *The price or value of the South African currency is determined by the policies of the government.*

(post-test) *The Minister of Finance and the Governor of the Reserve Bank can determine the Rand price on the foreign exchange market.*

This conception was also presented by 88% of the participating learners. A majority of the learners understood the concept in the form of their responses below. Compared with the post-test (61.4%) 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. 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 African, which has foreign exchange restriction, such as how much a traveller 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.

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”*. 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”*. Learner (L3) stated: *“... 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.

(pre-test): *The price of the Rand is determined by the amount of money South Africa gets from selling to other countries.*

(post-test): When international trade takes place and exchange of currency is necessary 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.

This conception is higher than the previous two but short of the structural aspect of the topic. Only 4.5% managed to achieve this level of conception in the pre-test. After the lessons were introduced, 18.2% of learners achieved this conception (Table 2). Learners in this category demonstrated that they partly understood how the Rand price is determined. This conception was shared by learners across the four schools studied. Most learners wrote that: *Local goods and services produced in the country and sold to other countries increase the value/ price of the Rand*⁷. 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.

"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".

None of the learners who took the pre-test provided an understanding at level 4 conception, based on the *referential aspect* (the global generally accepted meaning of the object or phenomenon conceptualised) of the understanding of the Rand value/price determination. 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. Only 20.4% of the learners in the posttest group compared with 0% in the pretest achieved a higher level of understanding of the 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 value/price. L20 wrote *"the supply of the Rand depends on the extent to which people/businesses...., wish to sell Rands in exchange for other currencies.* This implies, according to learners at the pre-test level, demand for the Rand is when importers and investors want to sell their currencies for the Rand. *"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.

Table 2. Distribution of Conceptions between Pre-test and Post-test on Rand Price Determination (Enacted object of learning).

Learners conception	Pre-test (200 learners)		Post-test (176 learners)	
	Learners (N)	Percentage	Learners (N)	Percentage
4	0	0	36	20.4
3	9	4.5	32	18.2
2	176	88	108	61.4
1	15	7.5	0	0
Total	200	100	176	100

Collectively, these conception categories or levels (1-4), describe the range of ways that

the difference in learning the phenomenon 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. All the four conceptions were identified in post-test and they represented the variation in the ways in which the learners experienced the phenomenon.

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/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. Table 3 provides a summary of the analysis of the learning outcome through the variation learning approach and as grounded in the phenomenographic study.

Table 3. Determination of Rand price/value. Summary of Pre-test and Post-test on Referential and Structural Aspects.

Category (Outcome space Levels)	Conception	Referential aspect	Structural aspect
A	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 Africa is able to export'
C	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
C	1	The learners focused on <i>performance</i> of the economy and <i>effect</i> 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

Table 3 above summarizes the findings. 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 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.

Conclusion

This article explored the extent to which learner understanding of a particular EMS phenomenon (Rand value/price determination) was enhanced through the variation theory of learning approach within the phenomenographic paradigm. Under the pre-test and post-test analysis, the article discussed how the theoretical concepts under phenomenography were used as tools to analyse and present the qualitatively different ways instead of the how much of learning outcomes. Using the categories of conceptions and outcome space analysis, the results showed a significant increase in the learners' understanding of the concept (Rand price/value determination). However, 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 (20.4%) was 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 in Table 2.

Despite the effect of ToV on learning outcomes, the study further revealed that any successful application of variation of learning principles into learning and teaching activities requires the educator to be a *specialist* in his or her subject matter; she/he must have the desire and capability as a *researcher* on educational matters in general and instructional materials in particular; she/he must have acquired experience and knowledge in educational principles including *pedagogical insight* as well as have the appropriate *attitudinal* expedience to interact with learners and learning related resources in general. It is also important that the learning programme and units of lessons are given enough *time* for instructional and other classroom activities. The extent to which educators were able to apply ToV in classroom practices was dependent on the above mentioned success factors. Perhaps if the educators involved in this study had achieved the highest level of these success factors, the learning outcomes as revealed by this study could have improved further.

Nevertheless, this article has highlighted the results of learning activities involving the EMS phenomenon which incorporated theoretical aspects of variation of learning and teaching under phenomenography. Conceptual tools that were also used to reveal the qualitatively different learning experiences gained through the qualitative and quantitative analysis include learning and teaching metaphor under phenomenography, objects of learning (intended, enacted and lived), conceptions (structural and referential) and outcome space categories. Thus, using these theoretical methods as a tool for analysis of learning outcomes revealed the qualitatively different ways learners experienced the EMS phenomenon and for that matter any other phenomenon and these could provide facilitators of learning outcomes additional classroom repertoire of instructionally related resources and techniques under OBE to further enhance learning and learning outcomes.

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