

EDUCATORS' CLASSROOM EXPERIENCES WITH VARIATION OF LEARNING THEORY

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Abstract

Classroom practitioners are expected to facilitate effective learning under the outcome-based education in South Africa. During this facilitation process, educators are required to become more resourceful in terms of their learning and teaching strategies. This article is based on a case study within the phenomenographic paradigm, of grade nine educators and learners in four schools in the North West Province of South Africa, on specific economics topic relating to the understanding of the value or price determination of the South Africa Rand on the foreign exchange market. The article is divided into three parts. Firstly, the concepts of phenomenography and variation theory of learning are explored and constituted as the conceptual framework for the study. The second part deals with educators' experiences with the variation theory as a classroom resource for learning. The last section of the article deals with the impact of educators' classroom experiences with the variation theory on learners' quantitative and qualitative learning outcomes. The results showed an improvement in the learners' understanding of the economics topic studied.

Key words: *phenomenography; variation theory of learning (ToV); conception(s); outcome space; enacted object of learning; educator, South Africa.*

Introduction

In outlining a new Policy Framework for Education the African National Council (1995), envisaged that the New National Learning system will be „learner-centred and achievement led”. This vision culminated in the passing into law of the New Schools Act of 1997 and the implementation of Outcome-based education (OBE) in 1998, which was officially implemented in 1999 at grades 1, 4 and 7 respectively. In October 2002, The National curriculum statement for grades 10–12 was launched for implementation from 2005 in grade 10. OBE strives to enable all learners to reach their maximum learning potential. The outcomes according to the Department of Education (2002) encourage a learner-centre 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 aimed to support educators use a particular learning theory as resource to assist learners create their own meaning as and when they experience the concepts, with specific reference to foreign exchange mechanism, through the variation theory in learning.

In its theoretical exposition, it is important to highlight key phenomenographical concepts, which are necessary to provide the point of departure for the literature review and analysis of the results. These key concepts provide the epistemological and methodological paradigm in which this study is grounded.

The Conceptual Framework of the Study

Phenomenography and the Variation Theory of Learning

The view of phenomenography is that learning is matter of seeing, or experiencing, something in a new way. 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 & Booth, 1997). The question of interest here is *how can we bring different ways of experiencing something about?* According to Marton & 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.

Within the variation theory of learning 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 (Marton 2001, Pang 2002 and Marton & Pang 2003). To investigate the teaching of *banking services specifically overdraft, for example*, from the described theoretical perspective, implies analysis of how different aspects of the content are focused upon or thematized, what aspects are left un-focused and whether the focused aspects open up dimensions of variations or not (Runesson, 2003). In phenomenographic perspective, learning occurs when the learner is able to identify the critical aspects of the objects and situations and focusing 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. According to Linder & Marshall (2003) learning cannot take place without discernment, while discernment cannot take place without variation. Using variations theory means 'trying alternative ways of understanding' (Marton, Asplund-Carlsson & Halász, 1992:10), a phenomenon 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. The following concepts within the variation theory are explained further herewith.

Conception(s) and Outcome Space

A *conception* is a unit of description in phenomenography (Marton & 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 & 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 (understood) upon by the learners. 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 case study the focus was on description of conceptions on 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. 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)...

Outcome space 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 a 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 assessing the learning outcome of those who took part in the case study, an outcome space was constructed (Diagram 1) on which the various conceptions for both pre-test and post-test results were locally categorised and analysed based on their hierarchical structural relationships.

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 variation of learning: the *intended* object of learning (intended learning outcome), this 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, there was the *lived* object of learning which refers to what was actually learnt, which depended upon what dimensions of variation of learning were actually experienced by the learners. In this case 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.

Studying Different Ways of Learning and Teaching the Content

Learning can be viewed as being a change in the ways in which one is capable of experiencing some aspect of the world. Research has been linked to attempts to bring about such changes by utilising certain approaches to teaching (Booth, 1997). Educator 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 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).

The object of the study is to explore the extent to which educators’ instructional methods are contributing to constitute the pattern of variation. Runesson (1999) study on educators’ 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 educators taught the same topic and in similar ways, different educators 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 educators 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 educator (Shulman, 1986). Educator 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 them. 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 account of which aspects of the teaching situation are in educators' focal awareness. Conclusions from these studies included the fact that during interviews about their teaching, educators 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 educators 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 seems 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 other 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. 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. Educators, whose approach is wholly or partially student-focused, describe changes in teaching approach according to year level by focusing on both the subject and the learner or the learner alone. Educators, whose approach is educator-focused, describe changes in their teaching approach according to year level and focus primarily on the subject. In addition, Leveson (2003), concluded that what educators regard as relevant learner experience is strongly related to how they approach their teaching. Those adopting a educator-focused approach seem to consider only subject experience as relevant; whilst student focused educators consider personal life experience to be relevant as well.

Ahlberg (1992) also concluded that where learners 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 (1992), when the educator pointed out the different ways learners had tackled the problem, mathematical ideas and principles were highlighted, *learner focus* rather than focus on the possible correct answer, the learners attention was directed towards the range of different methods of solutions in the presentation. In their study Andersson & Lawenius (1983) discovered that educators' conception of teaching is a complex phenomenon and it is only when conceptions are embedded in the educators' real world that they become logical and comprehensible. Thus the differences in the context and content explain possible differences between individuals and between groups.

Educators' Experience with variation theory in practice

Educators' approaches to teaching and their learners' approaches to learning have been investigated in several studies by a group of Australian researchers (Trigwell, Prosser, Ramsden & Martin, 1998). In these studies the educators' view on learning has been mirrored in their way of approaching teaching. „The approaches adopted by an educator in a particular context are a function of both the educator 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). In this study five approaches to teaching were found. These were grounded in the educators' intentions and strategies of teaching. In a later study congruence was found between science educators' intentions and the strategies of first year university students.

According to studies conducted by Prosser and Trigwell, (1999) and Trigwell, Prosser and Ginns (2005), educators who reported using more of a learner-focused teaching approach achieved a higher quality of approaches to learning, whilst classes of educators using more of an information/transmission/educator-focus reported more on surface approaches to learning. In her study involving learners' ways of experiencing and apprehending the subject matter in a problem-solving process, Rovio-Johansson, (1999) established that the students' learning objects have similarities with teaching objects of the lectures. Her findings included a claim that the learners 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. A study was conducted in Hong Kong, whereby 356 secondary school economics learners in the age range of 16-18 years were the participants (Pang and Marton, 2003). The participants were divided into two groups each with five economics teachers who also participated in the study. After series of lessons, the learners' understanding of the sales tax incidence 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 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.

Methodology of Research

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 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 those used to illustrate problems or indicate good practices. Case study is therefore appropriate to explore alternative meanings and interpretations

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 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. 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 approach 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). According to Pong (1999) and Pang (2002), the use of variation approach has two aims: firstly, to build innovative learning environments 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 fact the primary focus is however on an object of learning, not teaching methods. Variation can be used to enhance educators' pedagogical capabilities and professional development (Pang, 2002).

Research 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 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. Table 1.1 below provide details of the respondents.

After the series of lessons presentations, learners' understanding of the topic concerned was evaluated. The focus on variation principle, 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 level of learners' understanding as well as voicing confusions, are not only safe but valued – and by explicitly focusing on learners' attention on the shared task of improving learning the variation theory can help create meaningful communities of learners in the classroom. Rather 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 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).

Integrating variation into classroom activities within four schools

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 variation strategy. The educators and the researcher agreed after the pre-test to identify certain aspects of the phenomenon in which learners had made common mistakes. We 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.

We 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 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 educators 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. They 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. The theory of variation was revised with the educators as an input for instructional design in a less technical way. The theory of variation was exemplified in a way that 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. Educators were reminded of the notion of „ways of experiencing” using the example from Pong (2000) on the „conception of price”. Educators were aware of the four qualitatively different ways of conceptualizing price which could be accounted for by the different aspects of the phenomenon that were focused upon and discerned.

Educators were provided with adapted Tullberg research on „the mole” (in 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 and, C, 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 or a change in supply only, it will lead to Conception B. Some focus on the interaction of changes in demand and supply, then it will give rise to Conception C, 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. Refer to Diagram 1 for the outcome space for this presentation...

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 as outlined above. One educator commented:

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

Results of Research

Experiences of Educators on the Objects of Learning

Table 1 provides a summary of individual educator’s reaction to the process on the enacted object of learning.

Table 1. Comparison among Educators on the Enacted Objects of Learning.

	Educator 1	Educator 2	Educator 3	Educator 4
Building up Relevant Structure	Yes	Partially effected (not used the Nigerian and RSA example)	Yes	Partially effected (not used 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 texts of presentation	Yes	Partially effected (not used the case of Dlamini and his export and import business in the last lesson)	Yes	Partially effected (not used the case of Dlamini and his export and import business in the last lesson)

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

Table 1 above is a summary of the enacted object of learning as presented by the educators. 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 case 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 educators' performance factor cancels itself in the sense that in the study, each educator handles his/her own school, same learners and same topic in 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 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 3).

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 2) the conceptions for all learners in the pre-test and post-test were scored follows: In terms of this distribution (diagram 1), 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 1 and 2, Table 2) 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 2), their experience has improved with this Theory inspired approach. Other mitigating factors need to be ameliorated to ensure that all the teaching support systems are upgraded to uplift the quality and level of teaching.

OUTCOME SPACE CATEGORIES OF CONCEPTIONS OUTCOME SPACE LEVELS

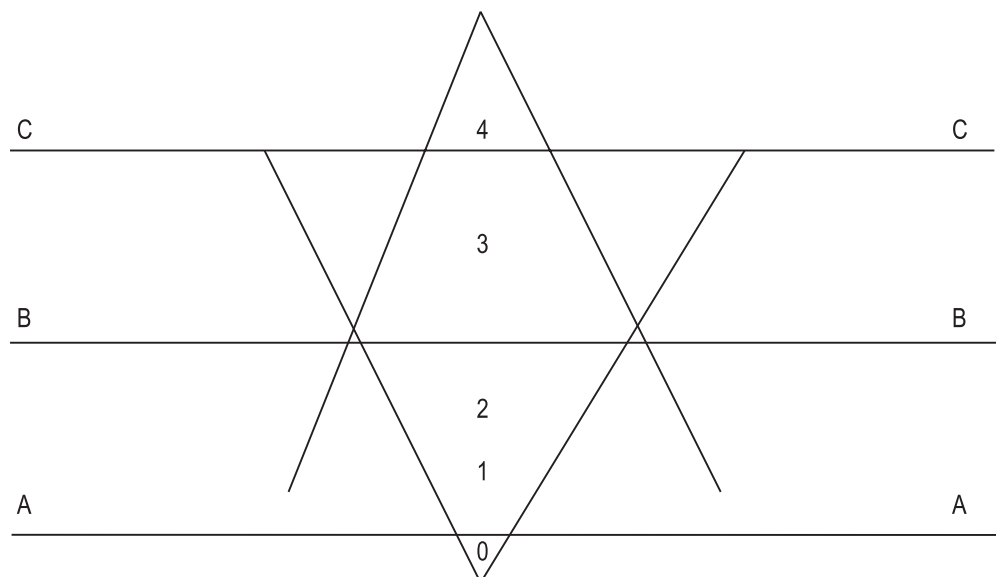


Figure 1. Outcome Space for Levels of Conceptions of How Rand Price / Value is Determined on the Foreign Exchange Market.

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 2. Distribution of Conceptions between Pre-test and Post-test on Rand Price Determination.

Learners conception	Pre-test (200 learners)		Post-test (176 learners)	
	Frequency	Percentage	Frequency	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

Reading across the two bottom rows of Table 2 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% 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, 20.4% 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 theory of variation.

Table 4. Analysis of Variance on Understanding Rand Price Determination for both Pre-test and Post-test.

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

Table 4 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 4). 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 3.

Table 3. 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.

SCHOOL	N		Mean		SD	
	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

Still on Table 3, 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 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 3 and 4). 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.

Conclusion

In the teaching analysis and given the positive relationship among active involvement in teaching and commitment to implementing the variation theory, 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. 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 level of learners' understanding as well as voicing confusions, are not only safe but valued – and by explicitly focusing on learners' attention on the shared task of improving learning the variation theory can help create meaningful communities of learners in the classroom. The main underlining strategy of the National Curriculum Statement (NCS) which saw its introduction into high school for the first time in 2006 was, among other things, to enable educators create an environment in which asking questions and voicing confusions are not only safe but valued – and by explicitly focusing learners' attention on the shared task of improving learning.

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 NCS is the development of effective educational community, which actively involves learners in the learning process. In this current South Africa situation and with the background of both pre and post apartheid education, 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 South African government has always felt the need to improve 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.

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. 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 variation theory would therefore enhance the OBE approach as practised in the South African educational milieu by integrating the principles of the variation theory of learning into classroom activities.

References

- Ahlberg, A. (1992). *The meeting with mathematical problems. An illumination of children's learning*. Göteborg: Acta Universitatis Gothoburgensis. <http://www.ped.gu.se/biorn/phgraph/civil/graphica/diss.su/ahlberg1.html>. 2008/11/22
- Åkerlind, G.S. (2005) Variation and commonality in phenomenographic research methods. *Higher Education: Research and Development*, 24(4), pp. 321–334
- African National Congress (1995). *A Policy Framework for Education and Training*. ANC. MacMillan.
- Andersson, E and Lawenius, M (1983), *Teachers' conception of teaching*. <http://www.ped.gu.se/biorn/phgraph/civil/graphica/diss.su/andlaw1.html>. 2008/11/22
- Booth, S. A. (1997). On phenomenography, learning and teaching. *Research and Development in Higher Education*, (16)2: 135–158.
- Cottel, P.G. (1991). Classroom Research in Accounting: Assessing for Learning. In T. A. Angelo (ed.), *Classroom Research: Early Lessons from Success*. New Directions for Teaching and Learning. No. 46. San Francisco: Jossey-Bass.
- Department of Education, (2002). [Online] *National Curriculum Statement Document*. Pretoria. October. <http://www.govt.org.econ.za>.
- Leveson, L. (2003). *Differences in an experience of difference itself: variation in the intra-individual experience of approaches to teaching*. Department of Accounting and Management; La Trobe University, Bundoora; L.Leveson@latrobe.edu.au.
- Linder, C., Marshall, D. (2003). Reflection and phenomenography: towards theoretical and educational development possibilities. *Learning and Instruction* 13(3): 271–284.
- Marton, F (2001). *Learning Study*. Manuscripts. Göteborg University, Sweden.
- Marton, F., Booth, S. (1997). *Learning and Awareness*. Mahwah, NJ: L. Erlbaum. Associates.
- Marton, F., Pong, W.Y (2005). On the unit of description in phenomenography. *Higher Education: Research and Development*. 24 (4), pp. 335–348
- Marton, F., Pong, W.Y (2005). On the unit of description in phenomenography. *Higher Education: Research and Development*. 24 (4), pp. 335–348
- Pang, M.F. (2002). *Making learning possible: the use of variation in the teaching of school economics*. Unpublished PhD thesis, The University of Hong Kong.
- Pang, M.F., Marton, F. (2003). *Beyond „lesson study“: Comparing two ways of facilitating the grasp of economic concepts*. *Instructional Science*, 31(3):175–194.
- Pong, W.Y. (1999). *The Dynamics of Awareness*. Paper presented at 8th European Conference for Learning and Instruction. August 24–28, 1999, Göteborg University, Göteborg, Sweden.
- Pong, W.Y. (2000). *Widening the space of variation – inter-contextual and intra-contextual shifts in pupils' understanding of two economic concepts*. Unpublished PhD thesis, the University of Hong Kong.
- Prosser, M., Trigwell, K. (1999). *Understanding Learning and Teaching. The Experience in Higher Education*. London: The Society for Research into Higher education and Open University Press.
- Rovio-Johansson, A. (1999). *Constituting different meanings of the content of Teaching and Learning in Higher Education*. Department of Education, Göteborg University. Paper presented at 8th European conference for Learning and Instruction august 24–28, 1999. Göteborg University, Sweden.
- Runesson, U. (2003). [Online] *The pedagogy of variation: Different ways of handling a mathematical topic*. Acta Universitatis Gothoburgensis. <http://www.ped.gu.se/biornphgraphica/diss.su/renesson.html> 2008/11/03
- Shulman, L. (1986). Paradigms and Research Programs in the study of Teaching. A Contemporary Perspective. In Wittrock, M (Ed). *Handbook of research on Teaching*. New York: MacMillan.

Trigwell, K. (2001) Phenomenography: Variation and Discernment. In C. Rust (ed) *Improving Student Learning, Proceedings of the 1999 7th International Symposium, Oxford Centre for Staff and Learning Development*: Oxford pp. 75-85. Oxford University.

Trigwell, K., Prosser, M., Ramsden, P., Martin, E. (1998). Improving student learning through a focus on the teaching context. In C. Rust (Ed.), *Improving Student Learning* (pp. 97-103). Oxford: Oxford Centre for Staff and Learning Development.

Trigwell, K., Prosser, M., Taylor, P. (1994). Qualitative differences in approaches to teaching first year university science. *Higher Education*, 27: 75–84.

Trigwell, K., Prosser, M., Waterhouse, F. (1999). Relations between teachers' approaches to teaching and students' approaches to learning. *Higher Education*, 37: 57–70

Trigwell, K., Prosser, M., Ginns, P. (2005). Phenomenographic pedagogy and a revised approach to teaching inventory. *Higher Education: Research and Development*. 24(4): 349–360.

Wood, K. (2006). Changing as a person: the experience of learning to research in the social sciences. *Higher Education: Research and Development*, 25(1): 53–66.

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