

## Facets of Integration in Economic and Management Sciences: Theory, Learning–Teaching, Assessment and Metaphor

Thomas Edwin Buabeng Assan<sup>1</sup> and Mutendwahothe Walter Lumadi<sup>2</sup>

<sup>1</sup>North West University, South Africa

<sup>2</sup>University of South Africa, South Africa

E-mail: <sup>1</sup><thomas.assan@nwu.ac.za>; <sup>2</sup><Lumadmw@unisa.ac.za>

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**ABSTRACT** This study is conceptualised against the background of addressing the principle of integration which is one of the fundamental issues of the National Curriculum Statement for Economics and Management Sciences (EMS) curriculum. A desk top review and document analysis were used to retrieve document, research articles, and anecdotal notes from teachers to reflect critically on fundamental issues pertaining to EMS at school level in the North West Province. Within the context of a new curriculum paradigm, the article establishes that EMS is an integrated discipline. Given that this is a subject in the new school curriculum, there are teaching and learning dimensions of EMS that need to be more carefully understood in order for effective instruction to take place. Within the phenomenographic paradigm, the theory of variation is presented and discussed as a useful theoretical resource for understanding learning in such a way that we are able to conceptualise more effective ways of teaching EMS. It is argued that understanding EMS and the constituents of EMS in the way presented in this article is not completely unproblematic. Nevertheless, understanding EMS in this way has powerful implications for thinking about effective EMS education in schools.

### INTRODUCTION

The nature of mixed economy that many South Africans are presently advocating under the new democratic government will, hopefully, usher in an education system based on a critical thinking curriculum. The demand for a new approach to teaching and learning was met with the introduction of outcomes-based education (OBE) in 1996 and its implementation in 1998. Accordingly, this article is an attempt to contribute ideas to the search for a new way of experiencing teaching and learning within OBE.

As Whitehead (1988) and Runesson (2012) point out, students live in a society which exhibits fewer consensuses on values and they lack complacency in tolerating a curriculum whose applicability they doubt. The school system is a melting pot of conflicting moral standards and conflicting cultures. Hence, the notion of authority is challenged and more justification is demanded for instructional activities.

### Objective of the Study

The implementation of the National Curriculum Statement (NCS) in 2003 followed by the revised Curriculum and Assessment Policy State-

ment (CAPS) in 2010 saw the introduction of EMS as an integrated subject in the senior phase (13 to 15 years). This new integrated subject therefore called for teachers to find innovative and creative ways for facilitating learning and teaching. 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; Department of Basic Education 2011). This paper argues that the introduction of variation in teaching and learning within the phenomenographic research approach would add to the repertoire of teachers' skills in facilitating knowledge, skills and attitude. It would also add another dimension to assessment which would enable the teacher not only to determine the quantity of learning, as was the practice in the past, but also the quality of learning by each learner. In this case, learning intervention activities could easily be developed and implemented. Phenomenography examines mainly the "qualitative ways people experience learning". From the principles of OBE outlined above, it is important for educators to understand how people experience learning qualitatively so that the conditions for creating effective learning in OBE can be maximised to enhance effective learning. This would help to ad-

vance the goals and principles of National Curriculum Statement (NCS) and Curriculum and Assessment Policy Statement (CAPS).

### Conceptual Framework

#### *The Variation Theory of Learning and the Concept of Phenomenography*

The view of phenomenography is that learning is a matter of seeing, or experiencing, something in a new way. These theoretical descriptions are used for analysing learning as well as teaching. To investigate the teaching of *banking services, specifically overdraft*, from the described theoretical perspective, implies analysing the way different aspects of the content are focused upon or thematised, what aspects are left un-focused and whether the focused aspects open up dimensions of variations or not (Runesson 2005). According to a phenomenographic perspective, learning occurs when the learner is able to identify the critical aspects of the objects and situations, focusing on them simultaneously (Wood 2006; Runesson 2012). 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, while discernment cannot take place without variation. Using variations theory means “trying alternative ways of understanding” (Marton and Pong 2005; Guo and Pang 2011) a phenomenon and making explicit the implications of their way of understanding the whole phenomenon or parts. In order to master an object of learning, the enacted object of learning – in other words the knowledge building and sharing that underpins learning – involves one being able to discern its critical features and also to focus on them simultaneously. 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 (Marton and Tsui 2004; Carstensen and Bernhard 2004, 2009). Some ways of experiencing are more powerful than others (in relation to certain outcomes). This

means that, the way something is experienced is fundamental to learning (Runesson 2012).

#### *Nature of EMS Education Prior To and After 1998*

According to Bredenkamp (1993), despite the fact that a core curriculum was used by the various education departments and that questions set by them, at face value, might be of the same standard, there were serious deviations in standards when marking answer scripts which pointed to the need to reform the South African school curriculum, especially with regard to EMS education. The purpose of EMS education, according to the Department of Education, is to equip learners with the 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. 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 the population.

Another aspect, which the assessment system failed to incorporate, was the affective considerations which, according to Curtis (1988), were of relevance to EMS in the wider context of the curriculum. The definition of Economics includes the normative function and the assessment system, which should include “both the cognitive and the affective domains” (Assan 2007).

In light of the above, EMS education in schools not only received a boost, but it also had a face lift. Instead of offering EMS mainly at the high school level then, the new curriculum extended the offering from foundation to FET level in various integrated modes, as explained below. According to Todd and Mason (2005), the main reason for the introduction of OBE at all levels was mainly to prepare young South Africans for a globally competitive and technologically sophisticated economy and this has accounted for the introduction of the revised curriculum, including EMS. Outcome-based learning, according to the Department of Education (2002), encourages 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 a phenomenographic approach hopes to develop a way in which learners could create their own meaning as and when they experience the concepts.

### METHODS

This study is conceptualised against the background of addressing the principle of integration which is one of the fundamental issues of the National Curriculum Statement for Economics and Management Sciences (EMS) curriculum. A desk top review and document analysis were used to retrieve document, research articles, and anecdotal notes from teachers to reflect critically on fundamental issues pertaining to EMS at school level in the North West Province South Africa.

### RESULTS AND DISCUSSION

#### Training for Teaching EMS Prior to 1998

EMS, like any other discipline, is not a compulsory subject at any teacher education institution and, prior to being made compulsory, few schools offered this discipline from the foundation to the senior phases. Even in the FET phase, few schools offered one or more of the EMS subjects, depending on the resources the schools had at that time. The implication was that, at the time EMS was made compulsory in the senior phase, few teachers had been trained or had received content knowledge as opposed to pedagogical knowledge in these disciplines. Hence, it was very difficult for those teachers who were called upon to teach or to offer EMS and meant that many of the teachers had low or no content knowledge even though they were compelled to teach EMS. In many instances they taught EMS from the textbook, and thus accounting, which is technical in content, was omitted from the instructional activities. This low content knowledge was emphasised as one of the priorities for professional development in the Department of Education's *Integrated Strategic Planning Framework for Teacher Education and Development in South Africa 2011–2025* (Department of Basic Education 2011). Prior to 1998 and thereafter, it is on record that

teachers should have received training in EMS, but these workshops were unable to provide the essential knowledge and skills needed in order to offer EMS. This situation has not changed.

In 2001, the University of North West (now call North-West University) introduced the ACE programme, which, since 2002, has offered a minimum of one year's teacher training in both content and pedagogical knowledge in EMS. Nevertheless, there is still a need for more and extensive training, as indicated by proceedings of the conference held in 2005 by the North West Provincial Department of Education (Department of Education 2005).

#### EMS as an Integrated Learning Area

The shift from a traditional curriculum to a new curriculum has brought with it innovations not only in teaching, but, more fundamentally, in terms of knowledge: what is to be taught and how to learn in schools. With the introduction of OBE in South Africa in 1998 it can be concluded that there was 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 the assessment of teaching and learning is transacted (Jephcote and Abbot 2005). The OBE approach signifies a move from the teacher-led transmission mode of teaching to a learner-centred, interactive and participatory style of learning, as well as to a more inclusive notion of assessment. EMS as a learning area consists of various subjects, including economics, business studies, office practice, accounting and entrepreneurship. Teaching EMS in an integrated way serves to provide learners with the basic knowledge which would support their choice of subject at the FET level and it also means that learners who exit at the GET band would have basic knowledge in financial management, unlike the previous curriculum dispensation which introduced learners to certain specific EMS individual subjects only at high school level.

Besides, the new curriculum also places an obligation on educators to teach and think about EMS in an integrated way. Educators handling EMS at the intermediate and senior phases have to be able to teach a bit of economics, accounting, business studies and the like. However,

many of these educators have limited experience and exposure to the disciplines of EMS and the majority has not studied accounting even though they have to teach it. In the classroom, many EMS educators avoid teaching accounting, the effect of which is realised when the Grade 9 learner enters the FET phase. The disciplines of EMS have conceptual and social dimensions in their essence and use. Thus, EMS disciplines, for example, economics and accounting, have highly conceptual domains and fields of knowledge consisting of concepts that are structured in specialised ways and which entail that the processes of knowing and understanding are specialised. The ability to do accounting or understand economics well, to represent and communicate accounting or economics effectively, is based on individuals having achieved a conceptual understanding of accounting or economics principles, concepts and procedures and the relations between concepts and procedures (Mwakapenda 2008). The Department of Education (Department of Education 2008) emphasises that learners should be provided with “powerful conceptual tools” to enable them to “analyse situations and arguments, make and justify critical decisions, and take transformative action”.

In outlining a new Policy Framework for Education (African National Congress 1995), the ANC envisaged that the new national learning system would 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 OBE in 1998, which was officially implemented in 1999 in Grades 1, 4 and 7. In October 2002, the National Curriculum Statement for Grades 10 to 12 was launched for implementation from 2005, beginning with Grade 10. The new curriculum also saw a reduction in the number of matric subjects from 134 to 35 and, in addition, the higher and lower grade system for each subject (under OBE) 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”. It further states, “everyone has the right ... to further education which the State, through reasonable measures, must make progressively available and accessible”.

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). This could form the basis for introducing EMS as an integrated discipline for Grades 1 to 9.

The purpose of EMS education, according to the Department of Education, is to equip learners with the 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 differs from apartheid education in the sense that such education was based on the principle of separate development, unlike today where the basis for education is 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.

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 therefore forms the foundation for the curriculum in South Africa. As such, 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, variation of learning theory, as a learning tool within the phenomenographic approach, hoped to develop a way through which learners could create their own meaning as and when they experience the concepts in EMS.

### **Nature of Integration**

The rationale for introducing EMS as a learning area and as compulsory for all learners in the NCS curriculum was based on the kind of learner the Department of Education envisaged for South Africa, namely, “one who will be imbued

with the values and acts in the interests of a society based on respect for democracy, equality, human dignity and social justice as promoted in the constitution” (Department of Education 2002). The nature of EMS integration in the school curriculum could be described in terms of a ladder. In this case, it is a four-step ladder (Harden 2000) where the first step can be described as *trans-disciplinary* with specific aspects of EMS being spread across all the learning areas of the foundation phase. The second step is described as *inter-disciplinary* where EMS topics are spread across social science, mathematical literacy and language learning areas. The third step on the ladder is *multi-disciplinary*, where EMS appears as separate but forms part of the eight compulsory learning areas in the senior phase. The final step is termed an *isolation approach* where EMS becomes a separate isolated subject in the FET phase. Learners attend classes on economics and may then move on to a class on accounting with neither teacher being aware of what was covered in the other class. In the next paragraph the steps of EMS integration will be discussed. This integration, according to the Department of Education (2002), would allow for applied competency across subjects and terrains of practice which would promote an integrated learning of theory, practice and reflection. However, the extent to which learners could realise this outcome would depend entirely on how educators are able to facilitate learning. This article, therefore, explores the learning and teaching metaphor to provide a repertoire to help educators apply the assessment standards to achieve the essence of integration. According to Mwakapenda (2008), the ability to make connections in an integrated curriculum is the key to the nature of competencies expected of learners. This implies the need for a shift in the way EMS is conceptualised and what we use to see in the ways in which EMS is constituted, taught and learnt (learning advantage).

### **New Ways of Teaching and Learning EMS**

Seeing that EMS as a learning area is fairly new as well as also the fact that it is already an integrated learning area (subject) consisting of different subjects (Economics, Leadership and Management, Entrepreneurship) and financial knowledge, does that mean that we should also teach and think about EMS in integrated ways?

Who needs to think and do what in what ways? The implication here is that the educators teaching this subject should be open to the issue of integrated teaching and integrating subjects in a predominantly integrated curriculum.

### **Learning Theories on EMS**

Sfard (1998) describes contemporary perspectives on learning in terms of two metaphors, the acquisition (constructivism) and the participation metaphor. Emanuelsson (2001) adds a third dimension of learning, what she calls the “constitutive” (the theory of variation/phenomenography). Lave (1996) is of the opinion that all learning theories should at a minimum address three aspects of learning, – the direction of learning, the mechanism and subject-world relation. Emanuelsson (2001) proposes three metaphors on learning, namely acquisition (constructivism), participation (socio-cultural perspectives) and constitution (theory of variation/phenomenography).

According to Emanuelsson (2001), the proposed third metaphor, that is, the phenomenography tries to transcend the theoretical gap between the other two. Phenomenography can, however, also be related to Gestalt psychology (Emanuelsson 2001; Gallos Cronberg and Emanuelsson 2010) but involves a more precise focus on how the learner sees, experiences or understands what is learnt (Marton and Booth 1997; Bowden and Marton 1998; Gallos Cronberg and Emanuelsson 2010). This article has chosen a phenomenographic approach as the new way of learning and teaching EMS as an integrated discipline, as well as individual subjects of the FET phase, such as accounting, economics and business studies. A consideration of the metaphor of learning and teaching as the focus of this article therefore follows.

### **Thinking in Metaphorically Integrated Ways**

OBE, as outlined in the guiding principles, emphasises the outcomes of learning which should be measured against specified learning outcomes and assessment standards. This is linked with phenomenographic principles which place emphasis on learning experiences. We shall discuss here in this metaphor of learning processes the literature underlining phenomenography.

### Conception

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 (understood) upon by the learners. A feature of an object or phenomenon, according to Marton and Pang (2005), 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. For example, *how* the different aspects of *overdraft* are focused upon or thematised, *what* aspects are left unfocused and whether the focused aspects open up dimensions of variations or not.

### 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 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). For example, the learning outcome of *overdraft* is a hierarchical order in the form of A1, A2, B1, B2.

### 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 pro-

cess. 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. According to Wood (2006), an object of learning can be constituted in three different ways within the theory of variation of learning: the intended object of learning (intended learning outcome), which was what educators planned for. The enacted object of learning, on the other hand, 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). Thirdly was the lived object of learning, which refers to what was actually learnt and depended on what dimensions of variation of learning were actually experienced by the learners, as explained below in the discussion on *overdraft*.

### *The Metaphor of Learning, Teaching and Assessing EMS*

Effective learning and teaching in an EMS classroom 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. Learning and teaching therefore constitute the “core 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. When we recognize this, the object of learning takes a much more different dimension than that of memorization and recall of knowledge. 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). Pang (2002) refers to the concept of *metaphor of learning* to reflect the view of phenomenography that regards learning as a matter of seeing, or experiencing something in a new way. There are transformative aspects involved in thinking about learning in this way: does seeing or experiencing something in a new way change that thing? Or, does it change the person doing the seeing and experiencing? Does the object being seen change? 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, that is, those aspects of phenomenon that 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 new situations in the future. Bowden and Marton (1998) point out that discernment "is 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. For example, a group of Grade 9 students were asked to explain in their own words, after a series of lessons on banking services, the concept of *overdraft*. The learning outcome can be categorised into four different experiences of the concept of overdraft:

- A1** "Overdraft is an amount that you have spent or want to spend that is greater than the amount you have in your bank account": in other words, *is an agreed amount with your bankers which allows the account holder to withdraw money over and above the credit balance or the deposit amount. An overdraft is a short-term loan, which requires repayment at a short notice.* The student does not specify the type of account that an overdraft can be granted. (4 students)
- A2** "Overdraft is the money borrowed by the bank to a person who has overdrawn or a situation in which one draws more money from the bank account than one has in it." [In other words, *this is similar to the above explanation except that here the students have equated an overdraft to money instead of to an amount, which can be expressed in currency terms.* Like the above explanation, the students failed to specify the type of account that an overdraft can be granted. (12 students)
- B1** "Overdrafts are money used in business but it does not own but it must be repaid over one year." *This explanation does not link an overdraft to banking services,*

*neither to any form of credit. Like A2 it refers an overdraft to money. Another aspect of this explanation is that an overdraft must be repaid within a year but it failed to mention whether an overdraft is a credit facility of some sort.* (6 students)

- B2** "Overdraft means the equation is shown in a statement called the balance sheet." *This explanation has linked an overdraft as an equation, which is reflected in a balance sheet. These students have seen an overdraft reflected in a balance sheet and their experience of the concept is limited to their knowledge of an overdraft as a figure reflected in a balance sheet.* (4 students)

The differences in ways of experiencing or understanding overdraft can be explained in terms of the "different aspects of the phenomenon as experienced that are simultaneously present in focal awareness" (Marton and Booth 1997). The learning experiences of students can be categorised into four main ways of understanding the concept of overdraft as experienced by the learners. The results of the study reveal that learning can be explained as a change in the aspects that are simultaneously discerned in the focal awareness of the learner. The aspects that are made present in awareness through teaching or the reading of text determine the object of learning. In this case, understanding overdraft in an A1 way rather than in a B1 way requires a change in focal awareness. This, it is argued, requires the experience of variation in those aspects of the phenomenon that must be present for that understanding. Without variation the aspects will not be discerned. Contextual factors can cause the focus of students' awareness to be other than on the functions of money and the concept of credit, leading to partial understanding of overdraft.

### Implications for Teaching, Learning and Assessing EMS

Teachers can address the learning difficulties that students have in relation to this phenomenon by presenting a pattern of variation that corresponded to this aspect. This can be referred to and described as an "EMS learning advantage" in this article. Variation in the arrangement in the forms of credit facilities and

bank deposits must be experienced by the student to allow this aspect of overdraft to be discerned. It would not be enough to simply describe a general idea of overdraft within the banking services. Rather, from the outset the learner, the reader of the text, must be invited to explore the implications of variation in banking services vis-à-vis credit facilities. Textbook material must be presented in such a way that this critical aspect is fore-grounded for the student.

Another implication of the theory is that teachers must be willing to reveal variation in students' ways of experiencing the phenomenon as another source from which all students in a class can learn. Some focus on credit forms, others focus on banking services and functions of money, while others bring these together in explaining overdraft. This is another source of variation. Students become aware of their own conceptions of credit as well as those of others. 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 (2003) concluded that it is important to ask the right question as well as for the teacher to be totally clear about what it is you are asking both of your subjects and your 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 (Andersson and Lawenius 1983; Annerstedt 1991; Alexandersson 1994) based primarily on interviews, have given accounts of which aspects of the teaching situation are in teachers' focal awareness. From these studies it can be concluded that teachers, when asked in an interview 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 come in to play here. In her study to establish the different ways in which teachers deal with content when teaching fractions and percentages, Runesson (1999, 2005) 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 student's learning simultaneously and this must be done against a background of an experienced variation of the aspects.

## CONCLUSION

In conclusion, 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. It is argued that understanding EMS and the constituents of EMS in the way presented in this article is not completely unproblematic. Nevertheless, understanding EMS in this way has powerful implications for thinking about effective EMS education in schools. 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. 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" 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.

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