



Beyond Lesson Studies and Design Experiments – Using Theoretical Tools in Practice and Finding Out How They Work

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Abstract

This paper aims to illustrate how fruitful insights into the link between school teaching practice and student learning outcomes can be theoretically grounded by the variation theory from the field of phenomenography; and from this framework demonstrate how a 'pedagogy of awareness' can be implemented in the classroom. In this study, five teachers and 162 students at Primary Four level of school education in Hong Kong participated and the practice of the 'learning study' was adopted. Within this approach the teachers worked out a shared lesson plan, which was implemented in five different classrooms. All of the lessons were videotaped and subsequently analysed. Pre- and post-tests were administered to compliment the evaluation of student learning. By comparing the results of the pre- and post-tests, a significant gain was observed in the students' learning outcomes. The findings contribute knowledge to how the variation theory can be put into classroom practice and how a 'pedagogy of awareness' grounded on a classroom-based theory of learning can be implemented. The notion of a 'pedagogy of awareness' was introduced as consisting of three dynamically linked elements: variation in students' ways of experiencing the object of learning, variation in teachers' ways of experiencing the object of learning, and the use of variation as a pedagogical tool to enhance students' learning. It promotes the 'mutual awareness' between teachers and learners by creating appropriate space of learning that makes learning possible.

Introduction

This article illustrates how the birth of insights in school practice can be *theoretically grounded* and demonstrates how a 'pedagogy of awareness' which is developed from a classroom-based theory of learning, the variation theory, can be implemented in the classroom. We do this by examining, in a new way, how teachers can handle objects of learning (what students are supposed to learn) in order to extend the possibility of learning as a way to improve learning outcomes. Although it is widely believed that to improve student learning in school settings, where much of what our society expects students to learn is concentrated, the quality of teaching is the most likely ingredient to make a difference (see, e.g. Stigler & Hiebert, 1999). And a good many studies that have been conducted on classroom practices (e.g. Hopkins *et al.*, 1994, 1997) concern the effectiveness of different pedagogical arrangements (e.g. whether students worked individually or in groups, or whether they had access to computers or worked only with paper and pencil). However, there have been extremely few definitive research conclusions emerging in the literature about a pedagogical arrangement that is, in general, distinctly most conducive to student learning. This has implied that the quality of teaching and consequent learning might not be able to be directly influenced by pedagogical arrangements *per se*.

Then, regardless of the pedagogical arrangement that a teacher adopts, teaching and learning must still have an object – teaching cannot take place in a vacuum. And what researchers have generally missed investigating is whether teachers can change the way they handle the object of learning in a systematic and theoretically grounded way in order to improve the possibility of learning and hence learning outcomes. To ascertain how better learning possibilities and outcomes may be constituted, the object of learning needs to be closely examined in terms of how it is made available to students in the classroom.

The study reported involves a team of five teachers who teach General Studies at the Primary Four level in the same school. The underlying assumption of the 'learning study' (Pang and Marton, 2003) idea that we draw on is that pedagogical acts should be driven by the nature of the capability to be developed and the theoretical assumptions about the kind of pedagogical acts that may achieve that objective. Our aim is to look for an approach that potentially enhances the possibility for our students to come to conceptualize given phenomena in more powerfully appropriate ways. Hence, working from a notion of price from an economic perspective, we looked for evidence that the taught concepts would not just be learnt in inappropriate ways, but that the students would develop capabilities to appropriately experience the notion of price.

To do this our 'learning study' took variation theory (Marton and Booth, 1997; Bowden and Marton, 1998; Marton and Morris, 2002; Pang, 2003) from the field of phenomenography as the theoretical framework.

Theoretical Framework

In phenomenography, learning is characterised as learning to experience *something* in a certain way (Marton, 1999; Marton & Booth, 1997). According to the consequent variation theory, there is no learning without discernment, and no discernment without variation. From this standpoint, learning amounts to being able to discern certain aspects of the phenomenon that one previously did not focus on or which one took for granted, and simultaneously bring them into one's focal awareness. Correspondingly, based on the non-dualistic stance and the principle of intentionality that phenomenography holds, teaching and learning are seen as an object-mediated relationship between teachers and learners, and teaching and learning must also be the teaching and learning of *something*. Hence, it is imperative for the teachers to take the *something to be learnt* – that is, the object of learning – as the point of departure when they design classroom instructions.

As Bowden and Marton (1998) argue, a given object of learning represents a possible way of experiencing something, upon which a certain human capability or value is developed. It is not just made up of a collection of concepts within the structure of an academic discipline. This is because the learning of a certain concept should enable a learner to see a phenomenon in a more fruitful, efficient and powerful way than they had previously, or which they usually would. For instance, taking an example from economics education, students should not just be learning about the notion of market price as an abstract economic concept, but rather should be developing a capability to look at, or experience, the notion of price from an appropriate economic perspective.

With such a characterization of meaningful learning, teachers should be mindful of the *intended* object of learning, that is, what capability is intended for the students – the object of learning seen from the teacher's point of view – and how the use of variation can help to bring it about. Marton and Booth (1997) argue that the object of learning could be thought of in two ways: as a direct object of learning, which refers to the "what" aspect of learning, the content that is being learned; and an indirect object of learning, which attends to the 'how' aspect of learning, the kind of capability the learner is trying to develop. These aspects are not separate entities; they only represent analytical facets of an undivided whole of the object of learning.

Extending these ideas the focus of a teacher should be upon an *enacted* object of

learning, or in other words, the object of learning that students have the possibility of experiencing from the teaching in the classroom.

So when drawing on variation theory as a fundamental pedagogical principle, the role of a teacher is to design learning experiences in such a way as to enhance the possibility for students to discern critical aspects of the object of learning. As phenomenography affords a non-dualist stance, teachers should focus neither solely on the learner nor solely on the content, but on the possible ways that the enacted object of learning might present itself to the learner which, within variation theory development, is typically characterised as the *lived* object of learning experienced by students.

In summary, it has been argued in phenomenography development-writing such as Marton and Booth (1997), that certain patterns of variation characterise certain ways of experiencing a phenomenon, and to bring about a particular way of experiencing a particular phenomenon, it is necessary to create the corresponding pattern of variation. This is the theoretical framework we have used to investigate how teachers make use of variation theory to design learning environments that create specific/particular patterns of variation for Primary Four school students to develop an economic understanding of the notion of price.

Method

The practice of the 'learning study' (Pang and Marton, 2003) was adopted as the research method of this study. A learning study combines the 'design experiment' (Brown, 1992; Collins, 1992) and the 'lesson study' models from Japan (e.g. Lewis, 2000; Stigler & Hiebert, 1999) and China (Ma, 1999). Hence, it principally has two aspects. First, a learning study aims to build innovative learning environments and to conduct research into theoretically grounded innovations. Second, it aims to pool teachers' valuable experiences into one, or a series of, research lessons to improve teaching and learning. The primary focus is on objects of learning, and not on teaching methods. Then, from this starting point our learning study went through the following stages.

- choosing an object of learning;
- ascertaining students' existing understanding;
- planning and implementing the lessons; and
- evaluating and revising the lessons

Choosing an object of learning

The object of learning agreed upon was to have Primary Four school students develop the capability to understand the notion of price in a basic, but fundamental economic way, i.e. price as determined by the interaction between market demand and supply. The choice of this teaching objective is based upon the belief that the determination of market price is one of the most fundamental concepts in economics that a functionally literate person should know. Furthermore, that such understanding presents some of the most difficult concepts for school children at Primary Four to master.

The initial characterisation of the object of learning and the attempt to achieve it should be grounded in theory was a shared conviction that drove the project. In this connection, after the teachers shared their own experiences of students' understanding of price, the researcher introduced them to the variation theory and the following summarised research studies about students' conceptions of price.

One of the earliest pieces of research in this area is the Dahlgren (1978) study of learning and teaching economics in a university, in which students' conceptions of price were explored. Two categories were found.

- A: Price is determined by the interaction between consumers and producers in the market.
- B: Price represents the production costs and reasonable profits of its various constituents and is related to the property of the object itself.

Dahlgren (1979) then investigated the ways in which non-university students conceived of price. The results from this study were slightly different from that of the previous study. Instead of having two conceptions of price, three qualitatively different ways of experiencing the notion of price were identified.

- A: Price is determined by the relationship between supply and demand for commodities.
- B: Price is determined by the value of a commodity or the accumulated value of its constituents.
- C: Price is determined by properties of commodities other than value, such as shape and size, etc.

Later these studies were extended by Pong (1998). He conducted an extensive study of high school students to investigate the qualitatively different ways in which students conceptualised price. The categories of description echoed Dahlgren's (1978) findings, which provided more sub-categories of the conception

Table 1 Conceptions of Price in the Pong (1998) study

Conception	Referential Aspect	Structural Aspect
A	Price reflects the value of the commodity concerned.	Focused on the commodity in question.
B	Price is related to the demand conditions of the market	Focused on the people who buy the commodity.
C	Price is related to the supply conditions of the market in which the commodity is situated.	Focused on the people who sell the commodity or the places where the commodity is sold.
D	Price is related to the opposing forces of demand and supply conditions of the market in which the commodity is situated.	Focused on both supply and demand aspects . simultaneously

of ‘the market’, namely, those related to *demand conditions*, *supply conditions* and the *opposing forces of demand and supply* in the market. Table 1 shows summarises the categories of description for the phenomenon of price.

After studying the materials carefully, the participating teachers began to develop a better understanding of the variation theory as well as the variation in students’ ways of experiencing price and their corresponding structural and referential aspects. This was useful in preparing the participating teachers to characterise the object of learning agreed upon and to attempt to develop theory-grounded ways to achieve it.

Ascertaining students’ existing understanding

To ascertain the students’ existing understanding in terms of the qualitatively different ways in which the students conceptualize price, the teachers administered a pre-lesson test. After much deliberation, the team decided that it would be most useful if we could, in an open-ended manner, capture variation in ways that students were currently experiencing price in their day-to-day encounters in the school. For example, hot dogs are very popular amongst students and almost all, if not all, students would have the experience of purchasing of a hot dog from the school Tuck Shop. Here, the following pre-test question was designed and all the students were asked to freely write down their response to the question.

Have you ever tried the hot dogs sold in our school tuck shop? Do you know how much they are sold? Maybe you know or you don’t know. Anyway, just for your information, hot dogs are now sold at HK\$4.50.

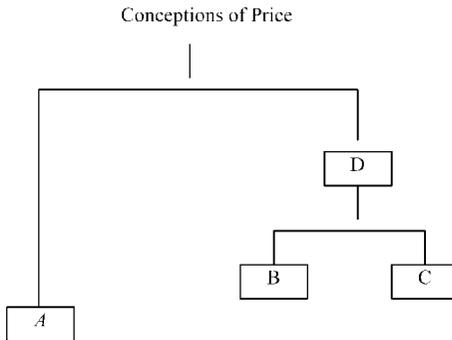
Suppose that you were the new owner of the tuck shop. What price would you set for a hot dog? Would you set the current price or a different price? What would you consider when you set the price?

The written answers from 162 students were analysed in the traditional hermeneutic manner common to the phenomenographic approach (for instance, see Marton & Booth, 1997). This analysis aimed at revealing the variation in pre-teaching conceptions regarding the phenomenon of price and four qualitatively different ways of understanding price were found. Table 2 shows the meaning and the structure of these conceptions.

As seen from Figure 1, Conception A was placed at a lower level than Conceptions B and C. It was because within the 'outcome space' of the results, Conception A was regarded as the least sophisticated. Conceptions B, C and D represent perceptions where price is system-oriented: it was more dynamic and abstract in nature. Thus, these conceptions are regarded as more advanced and sophisticated than

Table 2 Conceptions of Price in this Study

Level of Conception	Conception	Meaning of the conception in terms of what it is related to	Structure of the conception in terms of what was focused on
One	A	Price is related to the inherent value of the commodity concerned.	Focused on the features of the commodity itself.
Two	B	Price is related to the demand conditions of the market in which the commodity is situated.	Focused on the demand-side factors, such as the nature of the consumers.
Two	C	Price is related to the supply conditions of the market in which the commodity is situated.	Focused on the supply-side factors, such as the nature of the suppliers.
Three	D	Price is related to both the demand and supply conditions of the market in which the commodity is situated.	Focused on both the demand-side and supply-side factors simultaneously.
Undefined	Non-economic	Price is related to dimensions other than demand and supply.	Focused on non-economic factors, such as benevolence.

Figure 1. Outcome space of the Conceptions of Price

Conception A, and are placed at a higher level in the hierarchy. Conceptions B and C are placed at the same level because both suggest that price is related to one aspect of the context, either demand or supply. Conception D is placed above Conceptions B and C in the hierarchy because it represents a more complex and inclusive view of price, which takes into account the interaction between market demand and supply.

At this point it is necessary to stress that the variation reflected by the conceptions just described was not formulated between individuals, but between different ways of experiencing. This means that if one would like to look at individual spread an individual classification needs to be done. This was our next step, and the spread of *ways of thinking about price* that we found the students were coming to class with is shown in Table 3.

Table 3 Distribution of Conceptions for the Pre-test

Conception	Occurrence	Percentage
A: Object	12	7.4
B: Demand	92	56.8
C: Supply	11	6.8
D: Demand & Supply	11	6.8
Non-economic	6	3.7
Unclassified	30	18.5

The results were found to be a useful contribution for the planning of the learning study. The teachers found that students often attempted to account for the phenomenon of price by focusing on the demand-side factors only. They tended to look at it purely from the consumer's point of view and forgot to consider the supply side. Furthermore, the teachers believed that what caused students the most difficulty was the conceptualisation of the simultaneous interaction between demand and supply. Most of the students failed to put the two dimensions, *demand* and *supply*, together in determining the price. All teachers agreed that it was rather advanced for students at Primary Four level, as it represents sophisticated thinking.

In this connection, after studying the results carefully, it was finally agreed that the *most critical aspect* of an economic way of understanding price was the *simultaneous* focus on both the supply and demand aspects of the goods concerned (which is consistent with the findings from the research literature that is summarised earlier).

Another main reason for all the pre-test work was to provide a comparison baseline that the students' learning outcomes (measured by the same test) after the learning study could be compared with. As seen from the data summarised in Table 3 that only 6.8% of the students came to class with an appropriate economic way of conceptualizing price – by taking into account the demand-side and supply-side factors, which seems to be typical for such a very difficult and abstract concept for students at this Primary Four level.

Planning and implementing the lessons

The participating teachers then began to plan the 80-minute lesson, drawing on variation theory, to address the critical aspect, which has been identified in learning the notion of price. To achieve the object of learning agreed upon, the teachers drew on the pre-test results, their own experiences in dealing with this object of learning and the research findings of relevant phenomenographic studies. What they finally came up with was a fairly detailed lesson plan that was most thoughtfully deliberated.

Following their understanding of variation theory, in the teachers' discussion and planning, they made *conscious and systematic* use of the principle of variation. Hence, in three of the five different activities designed in their plan, to help students to discern the critical aspect of the object of learning they planned to systematically vary one or two aspects while keeping the other aspects invariant and in the background.

The lessons began by the teachers using a fund-raising auction game for building a new multi-media activity room, which is the “dream” of many students in the school. The teachers chose to use the simulation game of auction because they believed that by placing students directly into the economic environments being studied, classroom exercises or experiments could provide students with active learning experience. This might help students to learn economic concepts in a more effective way (e.g. Holt, 1996; 1999, Becker, 2004).

Activity 1

A teacher, acting as the auctioneer, first divided the class into groups of 6 students and allocated each group HK\$200/300 of auction money. The teacher then explained the rules of the auction game to the students and distributed the worksheets for students’ recording and reflection.

The learning-game started off by asking the students to discuss in their groups their planned bidding prices for the various items for auction. The teacher then displayed the goods (i.e., 2 dinosaur machines, 2 dolls, 3 sets of dinosaur cards and 3 stationery sets) with their base prices shown. The goods chosen for the auction were considered to be critically important, as they would greatly affect the level of participation of the students. Therefore, before we finalised the items for auction, the teachers interviewed some students (both boys and girls) to find out what items were trendy and what they would like to have most.

Then an actual running of the auction followed, with a representative of each group showing their hand to bid and the teacher recording the details of the transactions on a spreadsheet that was posted on the blackboard. A most important aspect was having the students note down the prices of the various items on the worksheets given and to discuss why some goods reached higher selling prices than others. A selection of students were invited to share their views and it was expected that some of them might attribute the higher price to the keener competition amongst groups, and the teacher could then use this as a springboard to develop the lesson further in Activity 2. The teacher asked the students to predict what would happen to the level of competition and thereby the prices of the goods when the auction money or their purchasing power was cut.

Activity 2

In this round of the auction, to bring students’ focal awareness to bear upon the dimension of demand, the teachers deliberately *varied the demand (through varying the purchasing power of the students) while keeping the supply and the types of the goods invariant*. A teacher cut the auction money of each group by \$100, and thus

their purchasing power and demand for goods were reduced. The supply and the types of the goods for auction, however, remained invariant.

After the auction, the students were asked to take note of the change in the market price of each item and to reflect on the possible relationship between the change in purchasing power of people (i.e., the demand for goods) and the corresponding price change. After discussing this in groups, some students were selected to share their views with the whole class. Based on the transactions data as well as students' answers, the teacher concluded the scenario by putting a paper strip on the blackboard and stating that given that the supply of the goods remains unchanged, the lower the purchasing power of the people, the lower the market price.

Activity 3

In this round, to help student to shift their focal awareness to the dimension of supply, a teacher deliberately *varied the supply while keeping the demand and the types of goods invariant and in the background*. A teacher reduced the quantity of each item for auction by one, i.e. 1 dinosaur machine, 1 doll, 2 sets of dinosaur cards and 2 stationery sets, while allocating the same amount of auction money to each group. There was a limitation of the study that owing to the fact that reasons for supply changes are more outside of the children's experience, and the teacher approach adopted, through auctions, does not lend itself to considering supply changes, the teachers only introduced a change in the fixed value of quantity supplied which could be considered as an extreme case of supply change with shifts of vertical supply curves at this level.

Similarly to the format in Activity 2, students were asked to observe the change in the market price of each item and reflect on the possible relationship between the change in the supply of the goods and the corresponding price change. The students first shared their insights with their group members and the teacher solicited the views of some students. By making use of students' contributions and the transaction data obtained, the teacher concluded this scenario by putting another paper strip on the board and stating that given that the purchasing power of people remains unchanged, the lower the supply, the higher the market price.

Activity 4

Finally, the teacher summarised all the central points that had been made and highlighted the assumption of "keeping the purchasing power (demand) or supply invariant" in the last two activities. By putting one of the two paper strips onto one side of the balance posted on the board, the teacher conveyed to the students the notion that the market price is in fact determined by the simultaneous interaction between the market demand and supply of the goods concerned, and that these

two opposing forces are equally important as illustrated by the balance of the balance on the two sides.

Activity 5

At the end of the lesson, the teacher assigned every student to individually complete a worksheet. To direct students' focal awareness on the critical aspect, i.e. simultaneous interaction between demand and supply, the students were guided to reflect on the implicit variations of the critical aspect as contained in the following question.

As you know, the dinosaur machine is now selling at \$80 in the toyshops. Suppose that you are the owner of a large toyshop, which is the sole supplier of the new model, which has not been publicly released and is issued as a limited version. At the same time, you observe that the Hong Kong economy has been recovering very well over this period of time. Given these conditions, what price will you set for this new model? Why?

In this case, implicit variations were introduced in both the demand and supply of the goods in a simultaneous manner. The students were led to reflect on these *simultaneous variations* by considering the variation in the supply of the goods as well as the variation in the purchasing power of people (demand for the goods). Students were then invited to express their views with the class to see whether they could experience the simultaneous variation in the dimensions of demand for and supply of the goods concerned and discern the critical aspect of experiencing price in an economic way. To draw a close to the research lesson, the teachers reinstated the conclusion that market price is determined by the interaction between market demand and supply.

Afterwards, all five teachers implemented the plan in their own classrooms. Further extending the spirit of the lesson study to foster genuine collaboration and developing a sense of ownership of the lesson plan developed for the teachers involved, our study introduced the arrangement of *team teaching*, which was well received. Two teachers, with a designated teacher in charge and the teacher who actually taught the class as the assistant, carried out each lesson. The researcher and all other teachers involved observed each of the classes.

Immediately after each trial, the researcher/teacher team conducted a post-lesson meeting to share observations and evaluate the planning and running of the lesson. The teachers participated actively in the sharing and made suggestions to fine-tune the lesson plan. Although there were some slight variations when the teachers carried out the lesson plan, they all followed and implemented the activities in a faithful manner. All of the lessons were video-recorded for later analysis.

Evaluating and revising the lessons

The researcher/teacher team conducted a post-lesson study to ascertain how well the students had developed the target capability after the teachers had implemented their research lessons. As aforementioned, the question in the pre-test was used again for the post-test, except that the commodity in question was changed from hot dogs to chocolate bars (another very popular item in that school tuck shop). The question is as follows.

Have you ever tried the chocolate bars sold in our school tuck shop? Do you know how much they cost? Suppose that you were the new owner of the tuck shop. What price would you set for a chocolate bar? Would you set the current price or a different price? What would you consider when you set the price?

162 students participated in the post-test. The student written tasks were then analysed, and the ways of experiencing that were identified were then categorised in accordance with the outcome space which was described in the previous section. The distribution of students' conceptions in the post-test is as follows.

As shown in Table 5, good gains were observed in terms of students' learning outcomes. Around 26 % of the observed ways of thinking in the post-test belonged to Conception D, that is, the object of learning wanted by the teachers. This was strikingly higher than the percentage for Conception D in the pre-test, which amounted to only 6.8%, which is highly significant (Chi-square = 151.643, for $df = 25$, $p < 0.001$). Hence, three times more students had developed 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 of market demand and supply in determining the market price.

Table 4 Distribution of Conceptions for the Post-test

Conception	Occurrence	Percentage
A: Object	11	6.8
B: Demand	85	52.5
C: Supply	9	5.6
D: Demand & Supply	42	25.9
Non-economic	1	0.6
Unclassified	14	8.4

Table 5 Comparison of the Conception Displayed by Students in the Pre-test and Post-test

Conception	Pre-test (162 students)		Post-test (162 students)	
	Occurrence	Percentage	Occurrence	Percentage
A: Object	12	7.4	11	6.8
B: Demand	92	56.8	85	52.5
C: Supply	11	6.8	9	5.6
D: Demand & Supply	11	6.8	42	25.9
Non-economic	6	3.7	1	0.6
Unclassified	30	18.5	14	8.4

Chi-square = 151.643 (df = 25), p = 0.000

Table 6 Cross-table of Conception Displayed by Students in the Pre-test and Post-test

		Post-test					
		Conception	A	B	C	D	Non-economic
Pre-test	A	3	5	0	3	0	1
	B	2	60	0	28	0	2
	C	0	3	6	1	0	1
	D	0	1	1	9	0	0
	Non-economic	2	2	0	0	1	1
	Unclassified	4	14	2	1	0	9

Furthermore, excluding those that fall under the categories of “non-economic” and “unclassified”, most students showed either no change or progression from a lower to a higher conception between pre- and post-test (Table 6). Among the 12 students displaying Conception A in the pre-test, five moved up to Conception B and three to Conception D, while three did not change. Of the 92 students holding Conception B in the pre-test, 28 progressed to Conception D but 60 still held Conception B and 2 even dropped to Conception A. Regarding the 11 students demonstrating Conception C in the pre-test, 9 remained at the same level holding either Conception B or C and one moved up to Conception D. Finally, among those who displayed Conception D in the pre-test, 9 retained this conception, despite the

fact that one student went down to Conception B and one to Conception C. This seems to show that the overall student learning outcome improved.

After all of the teachers taught the lesson, they met to produce an overall evaluation of the entire process. Whilst feeling that they could do better by taking more time to deliberate upon the critical aspects with the students, they were excited by what they had achieved, given that the time available was rather limited and the economic understanding of price was quite advanced to Primary Four students. All in all, they concluded that the variation theory that they employed could empower them to design their lessons to achieve the object of learning agreed upon in an elegant and efficient way. Suggestions were made to further improve the lesson plan.

Discussion and Conclusions

As seen from the learning data, variation theory may be argued to be a powerful tool in promoting student learning of the notion of market price, in terms of the possibility that it gave teachers to identify critical aspects related to different ways of understanding and to introduce simultaneous variation with respect to those critical aspects. By doing so, the teachers provided the students with what could be characterised as a *widened space of variation* that allowed them to have a better chance of experiencing the critical features of the object of learning. Consequently, the students' conceptualization of the phenomenon in question, the market price, was greatly enhanced. The improvement in terms of students' learning outcome was linked to how the object of learning was handled, structured, and presented in terms of variation and invariance, i.e. how the teachers constituted an appropriate pattern of variation to draw students' attention to those critical aspects of the object of learning. This was to a significant extent associated with the teachers' awareness of the role of variation and invariance for learning as demonstrated in their lesson plans and in their way of conducting the lessons.

Although the learning-study approach was deemed effective in bringing about student learning, our ultimate goal was not to claim a superior way of handling the object of learning, and thus no comparison group was arranged. Rather, it was our intention to illustrate how the birth of insights in school practice can be theoretically grounded and demonstrate how a 'pedagogy of awareness' which is developed from a classroom-based theory of learning, the variation theory, can be implemented in the classroom.

According to Marton and Booth (1996), to maximize possible learning, teachers should be mindful only of the content and/or the learner, but also the possible

ways the content might present itself for the learner (how the learner would experience the content). As argued by Marton and Booth (1997),

(Pedagogy depends on) meetings of awareness, which we see as achieved through the experiences that teachers and learners undertake jointly ... Teachers mould experiences for their students with the aim of bringing about learning, and the essential feature is that the teacher takes the part of the learner ... The teacher focuses on the learner's experience of the object of learning. Here we have (what we call) 'thought contact' (with) the teacher moulding an object of study (for the students) (p.179)

A pedagogy of awareness is thus to promote the 'mutual awareness' between teachers and learners, which consists of three essential elements: variation in students' ways of experiencing the object of learning, variation in teachers' ways of experiencing the object of learning and the use of variation as a pedagogical tool to enhance students' learning. This pedagogy is not confined to primary or secondary education only; it could be used effectively in higher education as well (for example, Fraser, et al., 2006; Linder, et al., under review).

According to Dahlgren (1978), a university education may not secure the depth of learning in economics that might be possible to achieve with younger students. The effects of the introductory economics course at the undergraduate level on helping students to develop a more sophisticated understanding of some economic phenomena were limited and the main change was merely the acquisition of the terminology used in economics. There seems an urgent need to enhance the quality of learning and teaching in the university. Based on the results of the present study, we would argue that being aware of the object of learning as experienced by both university students and teachers, as well as the essence of the variation theory, teachers can consciously make available a particular pattern of variation which will lead to a desired way of experiencing, and thus create a space of learning to provide university students with the opportunity to learn better.

University teachers should try to investigate the students' qualitatively different ways of experiencing the object of learning. Only when they can identify the variation in students' ways of experiencing, and the critical features related to a particular way of experiencing, can they employ variation as a pedagogical tool to direct students' focal awareness on those critical aspects, thus leading to the development of a certain way of experiencing the object of learning. Teachers might draw insights from running the diagnostic activity as suggested by Shanahan and Meyer (2003) to ascertain students' existing understandings. By pooling this information, teachers might be able to ascertain the critical aspects of the objects of learning and thereafter help students focus on these critical aspects

in a simultaneous manner through the use of variation as a pedagogical tool. By creating spaces of variation, a “pedagogy of awareness”, which has its main focus on the objects of learning, may bring theory and practice together to make learning possible at all levels of education.

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