

# From Phenomenography to Variation Theory: A review of the development of the Variation Theory of Learning and implications for pedagogical design in higher education

Gerlese Åkerlind\*

*The Australian National University and University of Canberra, Australia*

*The Variation Theory of Learning is a recent development arising out of the phenomenographic research approach. Phenomenography developed in the 1970s as a specialised field of enquiry focused on mapping experiential descriptions of the different ways in which people can understand the same phenomena. These theoretical developments also underpin Variation Theory, and formed the jumping off point for what became a new research direction, towards applied studies of pedagogical applications of the theory to the teaching and learning of disciplinary concepts. This paper reviews the development and application of Variation Theory, and describes the potential of Variation Theory to inform pedagogical design in higher education, using the example of students' learning of the concept of 'legal reasoning' in law to illustrate the type of research processes and outcomes that result from each stage of development of Variation Theory and its pedagogical application.*

**Keywords:** *Variation Theory; Phenomenography; curriculum design.*

## I. Introduction

The Variation Theory of Learning (Marton, 2015; Marton & Tsui, 2004) is a recent development arising out of the phenomenographic research approach. It has achieved prominence through, in particular, an extensive

---

\* Email: Gerlese.Akerlind@anu.edu.au

series of government-funded educational initiatives conducted in Hong Kong and Sweden (Lo, Marton, Pang, & Pong, 2004; Marton, 2015) that have enabled substantial empirical testing of the value of the theory for curriculum design. Whilst the Hong Kong and Swedish initiatives are focused on pre-tertiary education, the curriculum design implications for higher education are obvious, and there has already been a number of investigations conducted within a higher education context, with positive signs of the value of the theory (Åkerlind, 2008; Åkerlind, McKenzie & Lupton, 2011, 2014; Rovio-Johansson, 1999, 2013; Rovio-Johansson & Lumsden, 2012).

From a Variation Theory perspective, learning is seen as an expansion in awareness, in which students become aware of critical aspects of a disciplinary concept, skill or practice (abbreviated to concept for the rest of the paper) that they had not previously noticed. The theory introduces key principles of pedagogical design intended to enable students to progressively expand their awareness of the different aspects of disciplinary concepts, and of the relations between those aspects. These design principles guide the teacher in introducing systematic variation in illustrations of these critical aspects into their curriculum design. This acts to highlight each of the different aspects of the concepts under study, and how they can interact. This maximises students' opportunity to discern each aspect and thus come to understand the concept in a more complex and sophisticated way.

Variation Theory is derived from phenomenographic theory and shares its epistemological assumptions with Phenomenography (Bowden & Marton, 1998; Marton & Booth, 1997), but the empirical research associated with Variation Theory varies from Phenomenography in the object of study and research questions asked. Whilst phenomenographic research focuses on unpacking the different ways in which a concept may be understood (and misunderstood), research based on Variation Theory focuses on applying theoretically informed principles of instructional design in real world teaching and learning contexts.

In addition to the theoretical overlap between Variation Theory and Phenomenography, the learning value of applying Variation Theory to pedagogical design is enhanced when informed by preceding phenomenographic research into relevant disciplinary concepts (ideally in the form of teacher action research), as follows:

1. Phenomenographic investigation of variation in students' understandings (or misunderstandings) of a key concept to be learned. This involves the identification of educationally critical

aspects of the concept that students discern or do not discern in their understanding of it.

2. Use of the principles of Variation Theory to design teaching and learning activities that maximise students' opportunities for discerning the full range of critical aspects of the concept identified in the previous investigation(s).

So, on both theoretical and applied grounds, Variation Theory and Phenomenography are inherently intertwined. Thus, a good understanding of Variation Theory and its pedagogical potential is predicated upon a good understanding of Phenomenography.

In what follows, this paper will review the development and application of Variation Theory, starting with its origins in phenomenographic research and theory (see Table 1). The paper describes the potential of Variation Theory for informing pedagogical design in higher education, with particular examples from a two-year study in Australia led by the author and funded by the Australian Learning and Teaching Council (Åkerlind et al. 2011, 2014).

**Table 1:** Stages of development of Phenomenography to Variation Theory

Key developments	Associated publications	Changing research questions
Phenomenography commences; Methodological developments	Marton 1981, 1986  Bowden & Walsh, 1994, 2000	What are the collective range of ways of understanding a concept?
Theoretical developments; Variation Theory commences <sup>1</sup>	Marton & Booth 1997; Bowden & Marton, 1998	What aspects of the concept are discerned (and not discerned) within those ways of understanding?
Pedagogical applications of Variation Theory	Marton & Tsui 2004; Marton, 2015	What pedagogical design would maximise students' chances of discerning those different aspects?

## 2. The path to Variation Theory I: Development of a research approach focused on variation in learning and understanding

Phenomenography developed in the 1970s as a specialised field of enquiry focused on mapping experiential descriptions of the different ways in which people can understand the same phenomena (Marton, 1981, 1986). Although applicable to any phenomena in the world, physical or conceptual, the

research approach arose within an educational context and has traditionally been most concerned with investigating variation in understandings of educational concepts, in particular disciplinary concepts. The emphasis was on the pedagogical potential of this field of enquiry, “encouraging teachers to pay attention to students’ ways of thinking and to facilitate students’ realization that there are different ways of thinking may be the most important pedagogical implications of a phenomenographic view of learning” (Marton, 1986, p. 47).

In this sense, Phenomenography was initially defined in terms of the object of study: experiential descriptions of the qualitatively different ways in which students can understand<sup>2</sup> the same disciplinary concepts. The aim was to group and categorise these descriptions according to their most distinctive characteristics (Marton, 1986). This led to studies of students’ varied understandings of force and motion in physics, price in economics, recursion and proportionality in mathematics, the mole in chemistry, photosynthesis in biology, and so on (see Marton & Booth, 1997; and Prosser & Trigwell, 1999 for a summary of studies).

At that time, the most distinctive feature of Phenomenography was described as the focus on investigating the *content* of learning, as opposed to general principles of learning (Marton, 1981). However, an equally distinctive aspect is Phenomenography’s focus on the *structure* of understanding. Phenomenography assumes a part-whole structure to human experience or understanding, with different ways of understanding the same concept seen as interconnected parts of the whole composite of understandings. This leads to a search for inclusive or overlapping relations between different understandings, linking the different understandings in a hierarchy of expanding awareness.

In this sense, phenomenographic research has always had two aims, to investigate:

1. the range of distinctly different ways of understanding the same concepts;
2. the part-whole (inclusive) relationships between these different ways of understanding.

More inclusive understandings inherently represent more complex and sophisticated understandings, because they include awareness of the elements of the previous way(s) of understanding, but also show awareness of more elements. At the same time, more inclusive understandings also represent more ‘complete’ understandings, reflecting the part-whole

structure of the outcome space. Inevitably, this means that the most inclusive understanding in the hierarchy is also the ‘best’ understanding.

So, from its beginnings, Phenomenography has assumed part-whole and hierarchically inclusive structural relationships between different ways of understanding the same concepts. This underpins its primary pedagogical value, that phenomenographic studies serve to highlight what it is that students are commonly *not* noticing about a concept that prevents them from developing a sophisticated understanding of it, and what they need to notice in order to move from one way of understanding to a qualitatively better way. This structural aspect of phenomenographic research has been increasingly fine tuned over time, with further delineation of part-whole structural aspects during its theoretical development, and then again during the development of Variation Theory, as will be described below.

### **An example—legal reasoning in law: Part I**

Perhaps the best way to illustrate the developing and integrated nature of phenomenographic and Variation Theory research is through use of a cumulative example throughout the paper, illustrating the type of research processes and outcomes that result from each stage of development of the research approach and its pedagogical application. To do this I will draw on the two-year study mentioned in the introduction to this paper (Åkerlind et al. 2011, 2014).

As one part of this study, four law lecturers from three different universities worked with three educational researchers/developers in their universities to (1) identify a common disciplinary concept that students experienced particular difficulty in learning, (2) investigate variation in student understanding of that concept using phenomenographic research, and (3) design pedagogical interventions informed by the principles of Variation Theory.

The law lecturers chose to investigate the concept of legal reasoning. But before looking at the outcomes and pedagogical value of their investigation, it is informative to look at their preliminary sense of student difficulties in understanding the concept, based on up to 30 years of teaching experience. In advance of empirically investigating students’ understandings of the concept, the four law lecturers were asked to use their experience as teachers to speculate, as a group, on the nature of student difficulties in understanding legal reasoning:

Students have a conversational conception of a legal argument, they don’t have a professional conception of a

legal argument. They have an emotional basis to their legal reasoning, it's just a point of view, it is a personal belief/personal opinion (whereas lawyers have to argue something whether they believe it or not). Making a legal argument is following a given structure, not so much about the depth of content. Persuasion isn't enough without the evidence. They think the point of legal reasoning is for the marker [examiner] and to get marks, to show that they are clever. They don't have a notion of client and professionalism as the driver for knowing how to do it. They haven't got a sense of where legal reasoning fits into the service of law and the client. They haven't grasped that legal reasoning is not an abstract thing but relates to people's lives. They don't understand that legal reasoning is a form of informing the client.

The lecturers (and in some cases their tutors) then interviewed 21 of their first-year students about their understanding of legal reasoning. Phenomenographic methods have been described in detail elsewhere (Åkerlind, 2005; Ashworth & Lucas, 2000; Bowden & Green, 2005; Bowden & Walsh, 1994, 2000) and are not a focus of this paper, so I will simply jump to the outcomes which were that three qualitatively distinct categories of understanding emerged, ordered in a nested hierarchy of inclusiveness from 1-3:

- 1) legal reasoning as a formulaic process for predicting a legal outcome;
- 2) legal reasoning as an interpretive process of arguing for an outcome that benefits your client;
- 3) legal reasoning as a responsive and innovative process for developing the Law to reflect changing society.

These categories were reconfirmed during a later written task with 74 additional law students, who were asked to write a description of legal reasoning as a class exercise following a lesson on legal reasoning.

### ***Category 1: A formulaic process for predicting a legal outcome***

Responses allocated to this category highlighted legal reasoning as a structured process, but without reference to the possibility of developing different arguments or different conclusions from the same case. For example,

Legal reasoning is important in deconstructing legal problems. In identifying the legal issues/rules which arise



in the course of problem solving, legal reasoning provides a framework. This framework must be applied to the facts at hand sequentially and logically to reach a conclusion.

***Category 2: An interpretive process of considering different possible arguments and legal outcomes***

Responses allocated to this category also highlighted the structured process of legal reasoning (as with Category 1), but in addition, emphasised the importance of using the process to make different interpretations and arguments, acknowledging that different conclusions may be reached for the same case. For example,

The purpose of legal reasoning is to argue the facts of the case in different directions. There may be two or more similar cases with facts that have been decided and the issues/facts could be distinguished or have an analogy formed in relation to the outcome wanted. There may not be one particular right answer.

***Category 3: A responsive and innovative process for developing the Law to reflect changing society***

This category highlighted the role of different interpretations of the same case in legal reasoning, as with Category 2, but also went beyond this to show awareness of wider issues or impacts on Law.

The purpose of legal reasoning is to help comprehend, interpret and develop areas of Law. An understanding of legal reasoning is vital when determining possible outcomes and questions in Law, and also when predicting the development of specific areas of Law.

Now, let's consider the potential pedagogical benefits to the lecturers of this analysis, as compared with their intuitive sense of student difficulties in understanding described above. Whilst there is a clear overlap between the research findings and lecturers' speculations, the complexity and lack of structure to their speculations make it difficult to get a precise handle on how to design a pedagogical response, bringing to mind the old adage of not being able to see the wood for the trees. In contrast, engaging in the parsimonious rigour required by the phenomenographic research process has highlighted the key aspects of what constitutes a good and poor understanding of legal reasoning— i.e., the distinction between seeing the reasoning process as formulaic, interpretive or responsive, and the purpose as to predict the legal outcome, benefit the client or develop the Law. It



then becomes clear that these are the aspects of legal reasoning that need to be focused on in pedagogical design to help students come to a good understanding of the concept.

### **3. The path to Variation Theory 2: Development of a theory of learning and awareness**

As indicated above, phenomenographic research commenced from a strongly empirical rather than theoretical basis, so a key stage of development was the clarification of theoretical underpinnings of the approach. This was brought together in a landmark book by Marton and Booth (1997), called *Learning and Awareness*. In this book, the authors propose a theory of awareness, with strong implications for the nature of learning. Within this theory, learning is positioned as an expansion of awareness, meaning that a strong theoretical perspective on learning is constituted as a subset of the larger theory of awareness. Given Phenomenography's sustained focus on educational issues, the implications for learning and teaching are explicitly addressed in the book (as one might guess from the title), though the name 'Variation Theory of Learning' and is not explicitly used.

I will not attempt to describe all aspects of what is a complex theory in this paper, but focus just on the key theoretical elements needed to understand Variation Theory<sup>3</sup>. Phenomenography adopts a relational epistemology, positing that knowledge of the world is essentially non-dualistic in nature:

There is not a real world 'out there' and a subjective world 'in here'. The world [as experienced] is not constructed by the learner, nor is it imposed upon her; it is *constituted* as an internal relation between them.  
(Marton & Booth, 1997, p. 13).

This non-dualistic stance is perhaps best illustrated in contrast with dualistic epistemologies, such as the positivist/objectivist approach, which seeks to study an external reality independent of human interpretation, and the cognitivist/constructivist approach, which focuses on individual's internal constructions or representations of reality. These approaches may be seen as focusing on different sides of the person-world border, whereas Phenomenography de-emphasises the border, presenting knowledge as relational in nature. This is not to say that an external reality does not exist independently of human experience of it, but that it is both a non-attainable





and uninteresting object of study. The human world is an experienced world.

The implication for learning of this relational perspective is that students' understandings of disciplines and disciplinary concepts are seen as constituted on the basis of their experience. But as any experience (and associated understanding<sup>4</sup>) is relational, students' understanding of a disciplinary concept cannot be predicted from their exposure to the disciplinary content alone; it will be a relation between the student (and all of their past experiences) and the content to which they are exposed. This means that an understanding of disciplinary knowledge *as experienced by* students becomes vital in an understanding of how best to teach and learn disciplinary concepts.

Physiologically, it is impossible to be aware of everything in the world simultaneously. At any one point in time, we will be aware of some aspects of our world while others lie outside our awareness. This applies both to our awareness of whole objects or concepts, and our awareness of different parts or aspects of these objects or concepts. That is, not only is it impossible to be aware of every object in our environment at the same time, but for any one object, we cannot be aware of every possible aspect of the object at any one point in time. Returning to our focus in this paper on disciplinary concepts, even expert understanding of a concept represents only a particular understanding at a particular time in disciplinary development and socio-cultural history. So, although there will be a common set of aspects of a concept associated with expert disciplinary understanding at any one point in time, there is always the possibility of seeing more aspects at some other point (or context).

Variation in understanding of a concept is thus posited as due to variation in awareness of the aspects that make up that concept. This means that any way of understanding a concept can be described, analytically, in terms of the aspects of the concept that students (or experts) are aware of and those that they are not aware of. Any disciplinary concept may thus be considered, analytically, in terms of the set of constituent aspects of the concept that may be present in students' awareness of it. In addition, any one understanding of a concept can then be described in terms of which aspects of the concept have been discerned (and not discerned) in students' awareness of it, and how students' awareness of different aspects combines to make up an understanding of the concept as a whole. In this sense, poor understandings of a concept can be regarded not so much as wrong, but incomplete, and learning can be considered as the expansion of individuals'

awareness of a concept to include discernment of additional aspects of the concept not currently discerned.

But what does it mean to become aware of an aspect? Marton and Booth propose that awareness of an aspect occurs through the *experience of variation* in that aspect. A common example used by Marton is colour. If everything in the world were purple, then colour could not be experienced as an aspect of an object. Not even a sense of ‘purple’ could be experienced, as one colour can only be experienced in contrast to another. So, for an aspect to be discerned (actively noticed or experienced) and taken into account in dealing with a concept, an experience of variation in that aspect is essential. Without the experience of variation, the aspect is experienced as uniform in nature and implicitly taken for granted rather than actively considered in our understanding and application of the concept.

For example, with the concept of ‘legal reasoning’ introduced above, students’ understanding of the interpretive nature of legal rules was identified as a critical aspect of their overall understanding of legal reasoning (see Table 2, below). The least sophisticated way of understanding legal reasoning, as “a formulaic process for predicting a legal outcome”, involves an understanding of legal rules as rigid, unchangeable and completely clear (i.e., an implicit assumption of uniformity or invariance in the interpretation of a legal rule). This means that the potential for variation in interpretation of legal rules has *not* been discerned. In contrast, a more sophisticated understanding of legal reasoning, as “an interpretive process of arguing for an outcome that serves your client”, includes awareness of legal rules as ambiguous, and thus open to interpretation and manipulation. This means that the potential for variation in that critical aspect of legal reasoning *has* been discerned.

Thus, from a learning perspective, although any understanding of a disciplinary concept will be experienced holistically, in terms of the overall meaning that concept has for the student, *analytically*, any understanding can also be broken down into constituent parts, based on the different aspects of the concept that have been discerned in the student’s understanding of it. Empirically, this enables a part-whole structural analysis of students’ understanding of a concept in terms of:

- 1) the full range of constituent aspects of a concept identified within a selected group of students (and/or disciplinary experts); and
- 2) the subset of aspects that have been discerned and not discerned within each way of understanding the concept.

## An example—legal reasoning in law: Part 2

Let me illustrate the role of identification of constituent aspects in different ways of understanding through an extension of the analysis of the concept of legal reasoning introduced above (see Table 2).

**Table 2:** Different categories of understanding and critical aspects of legal reasoning (adapted from Åkerlind et al. 2011, p.17)

<b>Ways of understanding</b>  <b>Constituent aspects</b>	<b>Category 1: A formulaic process for predicting a legal outcome</b>	<b>Category 2: An interpretive process of arguing for an outcome that benefits your client</b>	<b>Category 3: A responsive and innovative process for developing the Law to reflect changing society</b>
Outcomes of legal reasoning	To accurately predict the outcome for client  <i>Legal outcome experienced as invariant</i>	To produce the best outcome for client  <i>Legal outcome experienced as varying</i>	To produce the best outcome for society  <i>Legal outcome experienced as varying</i>
Nature of legal rules (the Law) in legal reasoning	Rigid; completely clear  <i>Legal rules and interpretation both experienced as invariant</i>	Ambiguous; manipulable  <i>Legal rules experienced as invariant, but interpretation experienced as varying</i>	Changeable – dissents; exceptions  <i>Legal rules and interpretation both experienced as varying</i>

Based on this analysis of the critical aspects of the concept (as experienced by the students in the sample group), the different ways of understanding can now be seen as underpinned by awareness and lack of awareness of different aspects, as follows.

- 1) an understanding of legal reasoning as a formulaic process for predicting a legal outcome is underpinned by students' failure to discern variation in the critical aspects of legal outcomes, legal rules and interpretation of rules.
- 2) an understanding of legal reasoning as an interpretive process of arguing for an outcome that benefits your client is underpinned by

student discernment of the potential for variation in outcomes and interpretation of rules, but not the rules themselves.

- 3) an understanding of legal reasoning as a responsive and innovative process for developing the Law to reflect changing society is underpinned by student discernment of the potential for variation in legal rules (as well as outcomes and interpretation).

This elaboration of constituent aspects of concepts associated with the different ways of understanding the concept provides further justification for the phenomenographic search for hierarchically overlapping relationships between different ways of understanding. It also adds empirical rigour and pedagogical value to the constitution of hierarchies of understanding. Research rigour is enhanced by the expectation that the different understandings and hierarchy constituted need to be justified empirically in terms of constituent aspects of the concept. Pedagogical value is enhanced because teaching and learning activities can be targeted more precisely, focusing at the level of constituent aspects, not just different understandings of a concept. Lastly, this new theoretical perspective highlights how best to facilitate students' developing awareness of each aspect, by exposing students to the ways the aspects can vary. In this way, the Variation Theory of Learning was born.

#### **4. The path to Variation Theory 3: Applications of the theory to pedagogical design**

As explained above, the Variation Theory of Learning was first described in Marton and Booth (1997), although not given that explicit title. Marton's next book, *The University of Learning* (Bowden & Marton, 1998), focused specifically on learning and teaching, and the implications of his theory of learning for curriculum design in universities, particularly with respect to learning for an unknown future. The term, Variation Theory of Learning, was still not used, but strongly implied, and these two books formed the jumping off point for what became a new research direction, towards applied studies of pedagogical applications of the theory to the teaching and learning of concepts.

Marton contends that, although teaching methods and approaches are important in facilitating student learning, no approach can be successful if the necessary conditions for students to understand disciplinary content are not provided (Marton, 2015; Marton & Morris, 2002; Marton, Runesson & Tsui, 2004). This then becomes a more fundamental issue than whether teaching is problem-based, lecture-based, online, experiential, involves students as



active or passive participants in learning, etc. As described above, these necessary conditions are that students experience variation in the educationally critical constituent aspects of disciplinary concepts. In order to experience variation, students must be exposed to variation. So curriculum design, whatever the approach to delivery, needs to incorporate opportunities for students to experience variation in each of the constituent aspects of disciplinary concepts.

Having posited that to understand a concept in a complex way, (1) students need to become aware of the different aspects that make up the concept; and (2) the way in which students become aware of an aspect is by experiencing variation in that aspect, the next step in the development of Variation Theory was to test these propositions empirically. The first response amongst researchers was to start analysing naturally constituted pedagogical situations in terms of variation in aspects of the relevant disciplinary concepts spontaneously introduced by teachers. The approach was to focus on different situations of teaching the same concept, followed by analysis of variation in student learning outcomes based on the different patterns of variation they were exposed to in each teaching situation. Such studies consistently demonstrated learning outcomes in line with the patterns of variation to which students were exposed (e.g., Marton & Morris, 2002; Marton & Tsui, 2004; Rovio-Johansson, 1999; Runesson, 1999).

The second response was to start manipulating pedagogical situations, guiding teachers in introducing theoretically desirable patterns of variation in aspects of relevant disciplinary concepts. These studies often took the form of quasi-experimental 'learning studies'<sup>5</sup>, comparing the learning outcomes for students in 'experimental' versus 'control' learning designs. The impact of introducing Variation Theory into pedagogical design was typically dramatic, for example, 70% of the Variation Theory group versus 30% of the control group achieving the desired understanding of economic concepts (Pang & Marton 2003, 2005) and 85% versus 25% achieving the desired understanding of accounting concepts (Rovio-Johansson, 2013; Rovio-Johansson & Lumsden, 2012). The impact on professional development of the teachers involved was also substantial (Pang, 2006; Åkerlind et al. 2011, 2014).

The analytic studies came first and allowed observation of the impact of different patterns of variation on student learning, facilitating the development of more precise pedagogical design guidelines. Whilst exposure to variation in the critical aspects of a concept is a necessary condition for learning of the concept, such exposure does not guarantee learning. That is,

whilst it is impossible for students to notice variation in an aspect if they are not exposed to it, it is always possible for students to be exposed to variation but still not notice the variation. As claimed from the very beginning of phenomenographic research, it is the students' experience of the learning situation that determines their understanding, not the objective pedagogical conditions to which they have been exposed<sup>6</sup>.

To maximise students' chances of noticing variation in different aspects of concepts to which they are exposed, pedagogical guidelines emerging from Variation Theory research recommend the following patterns of variation (Marton 2015; Marton et al. 2004):

- 1) *Separation of aspects*—in order to experience each aspect of a concept and be able to consider these aspects independently of other aspects of the concept, students need to experience each of these aspects varying whilst the other aspects remain invariant.
- 2) *Fusion of aspects*—in order to take all of the critical aspects of a concept into account at the same time, the aspects must be experienced as varying simultaneously, in relation to each other. So, the experience of separation needs to be followed by an experience of fusion<sup>7</sup>.

Thus, in the design of a pedagogical interaction, it is recommended that teachers vary each of the critical aspects of the concept under study, one at a time, whilst holding the other aspects constant (invariant). This pattern of combining varying and invariant aspects seems particularly counterintuitive for teachers. Whilst all teachers spontaneously vary different aspects of a concept whilst teaching, what is much less intuitive is the simultaneous need for *invariance*; the recognition that what is *not* varied is as significant for students' learning as what is varied. As a consequence, teachers commonly vary multiple aspects of a concept simultaneously, and in an ad hoc rather than structured way. This can create confusing patterns of variation for students in which it is much easier to miss noticing variation in some of the critical aspects than if each is varied separately whilst the others are held constant.

Of course, variation of multiple aspects simultaneously is also essential for students' learning, in order to draw their attention to the ways in which the different aspects can interact, and encourage an integrated understanding of the whole. However, doing this *before* students have discerned each of the critical aspects separately is likely to impede rather than assist their learning.



### **An example—legal reasoning in law: Part 3**

Returning to our continuing example of the concept of legal reasoning in law, you will remember that the following aspects of legal reasoning emerged as educationally critical aspects of the concept: legal outcomes, legal rules and interpretation of rules (see Table 2, above). The least complex way of understanding legal reasoning (Category 1) was marked by students' failure to discern variation in these aspects. The next most complex understanding (Category 2) was underpinned by discernment of variation in outcomes and interpretation of rules, but not in the rules themselves. The most complex understanding (Category 3) was marked by discernment of variation in all three critical aspects. However, for first year students, most of the lecturers participating in the study aimed only for a Category 2, not Category 3, understanding of legal reasoning. So, based on the pedagogical guidelines from Variation Theory research, what pedagogical design is required to maximise students' chances of achieving the desired understanding of the concept?

To achieve a Category 2 understanding of legal reasoning, students need to be exposed to *separation* of the aspects of legal outcomes and interpretation of rules, followed by *fusion* of these aspects. (Students did not need to be exposed to variation in legal rules because this was only needed for a Category 3 understanding). This implies exposure to the following patterns of variation:

- 1) legal outcomes varied; interpretation of rules invariant
- 2) legal outcomes invariant; interpretation of rules varied
- 3) both legal outcomes and interpretation of rules varied simultaneously.

The four lecturers involved in the study devised a common lesson design following these principles (see Table 3). The design was based on students and teachers working through a series of legal cases (scenarios) built around the potential offence of speeding in a vehicle. Variation in establishment of the facts of the case was introduced into the design, in addition to variation in interpretation and outcomes, because the only way for legal outcomes to vary without variation in interpretation of legal rules is if there is variation in establishment of the facts of the case.

Scenario A set a basis for variation, with interpretation of rules and the legal outcome both held constant. Scenario B explicitly varied the facts of the case, leading to variation in outcomes, but without raising the possibility of varied interpretations of the rule. The final scenario actively introduced

variation in interpretation of the rule, which inevitably led to simultaneous variation in the outcomes of the case. A summary of the curriculum design based on the pattern of critical aspects of legal reasoning that were varied and held constant is outlined below in Table 3.

**Table 3:** Pedagogical design for separation and fusion of critical aspects of legal reasoning (adapted from Åkerlind et al. 2011, p. 23).

Scenario A – Fred driving at 60 kms in a 40 zone <ul style="list-style-type: none"><li>▶ facts invariant</li><li>▶ interpretation invariant</li><li>▶ outcome invariant (in the sense that only one legal outcome is predicted)</li></ul>
Scenario B – Fred driving at 45 kms in a 40 zone <ul style="list-style-type: none"><li>▶ facts vary (eg speed camera could be faulty)</li><li>▶ interpretation invariant</li><li>▶ outcome varies – depends on demonstration of facts</li></ul>
Scenario C – Fred in passenger seat, accidentally causes car to move, travels at 50 kms in a 40 zone <ul style="list-style-type: none"><li>▶ facts invariant</li><li>▶ interpretation varies – depends on interpretation of ‘driving’</li><li>▶ outcome varies – depends on arguments for interpretation of rule</li></ul>

As is often the case, the lecturers introduced more variation into the design than is ideal. There was originally an additional scenario between A and B, which I have removed for efficiency in communicating the core intended elements of the design. It would also have been better to keep the case as constant as possible across the scenarios, rather than varying the speed in each scenario. This is because any introduction of unnecessary variation has the potential to distract students’ attention from the critical aspects of the concept. On the other hand, these less than ideal aspects of the design illustrate the inevitable challenge faced by teachers working within a novel theoretical framework and introducing non-intuitive features into their teaching.

Having illustrated pedagogical design using Variation Theory, it would be nice to end my extended example with a comparison of student learning following this activity versus a control activity. Unfortunately, this was not part of the study, as it added so much complexity (and thus cost) to the research design. So, instead I will draw on the outcomes of Rovio-Johansson’s four-year study of first year university students in accounting. She examined students’ understanding of economic concepts in three



accounting courses, following exposure to traditional lecture designs in one year (Comparison group) versus exposure to Variation Theory inspired lecture designs in the following year (Target group), after the lecturers had been introduced to Variation Theory. The results were dramatic (see Table 4).

**Table 4:** Comparison of students achieving a good understanding of accounting concepts in three courses (adapted from Rovio-Johansson & Lumsden, 2012, p. 79)

	Course 1		Course 2		Course 3	
	Target Group	Comparison Group	Target Group	Comparison Group	Target Group	Comparison Group
Good understanding demonstrated	85.5%	26.0%	72.8%	38.4%	58.0%	25.5%
Total number of students in Group	n=180	n=177	n=151	n=157	n=159	n=149

## 5. Implications for curriculum design in higher education

Despite the small number of studies using Variation Theory in a higher education context, it is clear that the theory can be readily applied to university education. The greatest barrier is the potential cost and time-intensive nature of the undertaking. To take full advantage of the pedagogical potential of Variation Theory, we need to integrate all three stages of the development of Phenomenography and Variation Theory<sup>8</sup>:

- 1) conduct phenomenographic investigations of variation in understanding of key disciplinary concepts;
- 2) use Variation Theory to identify variation in awareness of the critical aspects underlying the different understandings of those concepts;
- 3) apply the pedagogical principles derived from Variation Theory to inform design of teaching and learning activities addressing those concepts.

But how can such intensive investigation of a disciplinary concept be justified when there are so many concepts in each discipline? In the Åkerlind et al. study (2011, 2014), we proposed that the idea of 'Threshold Concepts' should be used as a guiding notion for deciding which disciplinary concepts are worthy of this much dedicated curriculum design attention. The proposition underlying Threshold Concepts is that there are a limited number of concepts within each discipline that are 'threshold' in nature, in that they act as 'conceptual gateways' to disciplinary ways of thinking about a subject area (Land, Smith & Meyer, 2008; Meyer & Land, 2003, 2005, 2006;

Meyer, Land & Baillie, 2010). Once understood, they transform students' views of the subject area, because they enable students to coherently integrate what were previously seen as unrelated aspects of the subject, providing a new way of thinking about it. However, the transformative and integrative nature of these concepts makes them especially difficult for students to learn. Meanwhile, due to the threshold nature of these concepts, any resulting misunderstandings have long-lasting implications for students' learning in the subject area, and their ability to apply that learning in professional practice.

A focus on Threshold Concepts in curriculum design highlights for teachers areas of the curriculum that deserve special attention, not only because they represent transformative learning points for students, but because they are areas where students are most likely to experience difficulties. In addition, the integrative nature of Threshold Concepts means that a good understanding of these foundational concepts facilitates understanding of a host of related concepts, leading to an impact on student learning far beyond the individual concept in isolation. (Åkerlind et al. 2014, p. 230)

We also suggested that curriculum design using Phenomenography and Variation Theory would be most effectively implemented at a system-wide level, in discipline level reviews or national projects, such as those funded by the Office for Learning and Teaching in Australia and the Higher Education Academy in the UK. This would allow systematic identification of Threshold Concepts in a discipline and of the critical variation in student understandings and awareness of the underlying aspects of these concepts. Designs for teaching and learning of the concepts using Variation Theory could then be tested and shared, greatly reducing the workload impact on any one teacher.

Meanwhile, teachers who have been exposed to this approach to pedagogical design have experienced dramatic professional development benefits (Åkerlind et al. 2011, 2014; Pang, 2006). In the Åkerlind et al. study referred to throughout this paper, the lecturers involved reported a transformational impact on (1) their understanding of student difficulties in learning legal reasoning, (2) how best to teach legal reasoning, and even (3) their own personal understanding of the concept as disciplinary specialists. Given that the lecturers were experienced academics, this last benefit was particularly pleasing and exceeded the anticipated outcomes of the project. Overall, the lecturers were keen to continue using the design method and

happy to recommend it to colleagues despite the resource-intensive nature of the approach, as illustrated by this quote from the project evaluation:

...the way that we worked out the [pedagogical design] methodology will certainly be effective and will definitely be used in all future introductory Law subjects. (Åkerlind et al. 2014, p.243)

## 6. Acknowledgments

I would like to thank Peter Kandlbinder for inviting me to prepare this review of the development of Variation Theory, and Ference Marton and Ming-Fai Pang for their comments on a draft.

Funding for the Åkerlind et al. 2011 project was provided by the Australian Learning and Teaching Council (ALTC), an initiative of the Australian Government Department of Education, Employment and Workplace Relations.

## 7. Notes

1. Initially, the most common term for the phenomenographic object of study was 'conceptions', but there was a move away from this in the 1990s, largely because of the inappropriate cognitive connotations associated with the term. Now, 'ways of experiencing' and 'ways of understanding' are more commonly used terms. But they all represent the same object of study, ie "the various ways in which people experience, interpret, understand, apprehend, perceive or conceptualise various aspects of reality" Marton, 1981, p. 178.
2. This second stage of development in Phenomenography led to references to 'new Phenomenography' in the late 1990s and early 2000s. This term is often thought to refer to the development of Variation Theory and associated research, but it was actually about the theoretical development of Phenomenography (Marton and Pang, 1999). Meanwhile, the term 'new Phenomenography' quickly fell out of favour.
3. For an explanation of the role of internal and external horizons of awareness; the theme, thematic field and margin of awareness; simultaneity and contemporaneity in awareness; the direct object, indirect object and act of learning; intentionality; and the relevance structure of any situation, see Marton and Booth (1997).
4. The way one experiences something is the way one understands it, and vice versa. The two are equivalent in phenomenographic terms.



5. 'Learning studies' build on the Japanese concept of a 'lesson study', in which teachers with overlapping curriculum content meet to jointly plan a lesson addressing that content, teach the lesson separately, then meet again to compare learning outcomes and revise future lessons on the same content area. Learning studies follow this design, but introduce a theoretical basis for joint lesson planning, based on Variation Theory.
6. On this basis, Variation Theory draws a clear distinction between the intended, enacted and experienced object of learning in any pedagogical setting. The intended object of learning is the concept as teachers plan to present it to students. The enacted object of learning is the concept as actually presented to students, given that lessons rarely go precisely according to plan. The experienced object of learning is the concept as actually experienced by the students during the lesson.
7. Marton also recommends 'contrast' and 'generalisation', but this is at the level of discerning the concept as a whole, not individual aspects of the concept.
8. Stages 1 and 2 can be completed by researchers independently of Stage 3, or undertaken as an action research project by teachers in advance of Stage 3, as recommended in Åkerlind et al. 2011, 2014. It is also possible for teachers to use their past experience of student learning to address Stages 1 and 2, by speculating on where students experience difficulty in understanding a concept, in terms of key aspects of the concept that need to be discerned by students to achieve a good understanding of it. However, as demonstrated above, such speculation will not be as precise as an empirical investigation of student understanding.

## 8. References

- Åkerlind, G. (2005). Variation and commonality in phenomenographic research methods. *Higher Education Research and Development*, 24, 321-334.
- Åkerlind, G. (2008). A phenomenographic approach to developing academics' understanding of the nature of teaching and learning, *Teaching in Higher Education*, 13, 633-644.
- Åkerlind, G., McKenzie, J., & Lupton, M. (2011). *A Threshold Concepts approach to curriculum design: Supporting student learning through application of Variation Theory*. Sydney: Australian Learning and Teaching Council. Available from <http://www.olt.gov.au/resource-library>.
- Åkerlind, G., McKenzie, J., & Lupton, M. (2014). The potential of combining Phenomenography, Variation Theory and Threshold Concepts to inform curriculum design in higher education. In J. Huisman & M. Tight (Eds.), *Theory and Method in Higher Education Research II. International Perspectives in Higher Education Research (Vol. 10 pp. 227-247)*. Bingley, UK: Emerald Publishing Group Ltd.

- Ashworth, P., & Lucas, U. (2000). Achieving empathy and engagement: A practical approach to the design, conduct and reporting of phenomenographic research, *Studies in Higher Education*, 25, 295-308.
- Bowden, J., & Green, P. (Eds.). (2005). *Doing developmental phenomenography*. Melbourne: RMIT Press.
- Bowden, J., & Marton, F. (1998). *The University of Learning*. London: Kogan Page.
- Bowden, J., & Walsh, E. (Eds.). (1994). *Understanding Phenomenographic Research: The Warburton Symposium, EQARD*. Melbourne: RMIT University Press.
- Bowden, J., & Walsh, E. (Eds.). (2000). *Phenomenography*. Melbourne: RMIT University Press.
- Land, R., Smith, J., & Meyer, J.E. (Eds.). (2008). *Threshold Concepts within the disciplines*. Rotterdam: Sense Publishers.
- Lo, M., Marton, F., Pang, M., & Pong, W. (2004). Toward a pedagogy of learning. In F. Marton and A. Tsui (Eds.), *Classroom discourse and the space of learning* (pp. 189-226). Hillsdale, NJ: Lawrence Erlbaum.
- Marton, F. (1981). Phenomenography – Describing conceptions of the world around us. *Instructional Science*, 10, 177-200.
- Marton, F. (1986). Phenomenography – a research approach to investigating different understandings of reality. *Journal of Thought*, 21, 28-49.
- Marton, F. & Booth, S. (1997). *Learning and Awareness*. Hillsdale, NJ: Lawrence Erlbaum.
- Marton, F., Runesson, U., & Tsui, A. (2004). The space of learning. In F. Marton and A. Tsui (Eds.). *Classroom Discourse and the Space of Learning*, (pp. 3-40). Hillsdale, NJ: Lawrence Erlbaum.
- Marton, F., & Morris, P. (Eds.). (2002). *What Matters? Discovering Critical Conditions of Classroom Learning*. Gothenburg Sweden: Acta Universitatis Gothoburgensis.
- Marton, F., & Pang, M. (1999, August 24-28). *Two Faces of Variation*. A Paper presented at the 8th European Association for Research in Learning and Instruction (EARLI) Conference, Gothenburg, Sweden.
- Marton, F., & Tsui, A. (2004). *Classroom Discourse and the Space of Learning*. Hillsdale, NJ: Lawrence Erlbaum.
- Marton, F. (2015). *Necessary Conditions of Learning*. New York & London: Routledge.
- Meyer, J., & Land, R. (2003). Threshold Concepts and troublesome knowledge: Linkages to ways of thinking and practising within the disciplines. In C. Rust (Ed.), *Improving Student Learning Theory and Practice– 10 Years On*. Oxford: Oxford Centre for Staff and Learning Development.
- Meyer, J., & Land, R. (2005). Threshold Concepts and troublesome knowledge (2): Epistemological considerations and a conceptual framework for teaching and learning. *Higher Education*, 49, 373-388.
- Meyer, J., & Land, R. (Eds.). (2006). *Threshold Concepts and Troublesome Knowledge*, Routledge, London and New York.
- Meyer, J., Land, R., & Baillie, C (Eds.). (2010). *Threshold Concepts and Transformational Learning*. Rotterdam & Taipei: Sense Publishers.
- Pang, M. (2006). The use of learning study to enhance teacher professional learning in Hong Kong. *Teaching Education*, 17, 27-42.

- Pang, M., & Marton, F. (2003). Beyond “lesson study”: Comparing two ways of facilitating the grasp of some economic concepts. *Instructional Science*, 31, 175-194.
- Pang, M., & Marton, F. (2005). Learning theory as teaching resource: enhancing students’ understanding of economic concepts. *Instructional Science*, 33, 159-191.
- Rovio-Johansson, A. (1999). *Being good at teaching: Exploring different ways of handling the same subject in higher education* (Gothenburg Studies in Educational Sciences Series). Acta Universitatis Gothoburgensis: Gothenburg, Sweden.
- Rovio-Johansson, A., & Lumsden, M. (2012). Collaborative production of pedagogical knowledge: enhancing students' learning. *Journal of Applied Research in Higher Education*, 4, 72-83.
- Rovio-Johansson, A. (2013). An application of Variation Theory of Learning in higher education. In M. Tight & J. Huisman (Eds.), *Theory and Method in Higher Education Research. International Perspectives in Higher Education Research* (Vol. 9 pp. 261-279) Bingley, UK: Emerald Publishing Group.

