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A RESPONSE TO THE COMMENTARIES

Exploring the nature of academic understanding

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Colin Smith, who has taken over from John Nisbet as co-author in this response, introduced the contrast between target and personal understanding in his PhD, which John Nisbet examined, and has continued to follow the topic with interest in his subsequent career as a schoolteacher and educational researcher.

The lead paper looked forward to clarification of the nature of understanding coming from the commentators and accepted the need to be recursive in responding to other perspectives. We are grateful for the wealth of ideas contained in the comments and will do our best to consider them in relation to our own broadening conception of the topic. We have identified a number of themes that can be used to frame our response, although it was impossible to do justice to the whole range of suggestions we were given, while also taking account of Hume's encouragement "to correct all that seeming disorder" in which the topic then, and still, lies.

Understanding depends on existing conceptual frameworks and is recursive

It was clear in preparing the lead paper that part of the problem in defining the nature of understanding is that theorists come to it with differing conceptual frameworks. This conclusion was strengthened by meeting yet other perspectives in the commentaries, and highlighted the first important aspect, missing in the lead paper. Peter Davies, looking from his own experience in researching economics teaching, stressed that the learner's capacity to achieve an appropriate academic understanding of a topic "appears to be contingent on the conceptual structures they are able to bring into being". And that explains why academic understanding within a university is necessarily recursive, as new concepts are introduced at successively more complex levels to produce sophisticated ways of dealing with topics and so extending existing conceptual frameworks.

In their studies of economics education, Davies and Mangan (2008) have used the idea of 'threshold concepts' that form a 'portal' through which students have to pass to transform their understanding of the subject and so form part of the 'target understanding' that is set by academic staff. These threshold concepts are often ideas that

have, in the past, transformed researchers' ways of thinking about the discipline and need to be grasped by students if their understanding is to develop smoothly. Davies and Mangan showed how students meet different kinds of thresholds. Basic concepts allow newcomers to the discipline to reinterpret everyday ways of thinking in more powerful ways, later on threshold concepts within the discipline show how groups of basic concepts can be integrated in meaningful ways, but the most complex threshold involves beginning to think like an economist, seeing how to engage with the discourse of the discipline and make use of the disciplinary models and theories to deal with new topics or problems. A crucial part of this final step is being able to enter the dialogue of the discipline and so communicate with experts and extend understandings further, in the ways described by Hazel Francis. And, as Peter makes clear in his comments, students have to be recursively reconstructing their academic understanding as they gain access to more sophisticated conceptual structures. This leads us to the related theme of discipline and culture.

Understanding depends on the discipline and the culture

The process of developing academic understanding involves adopting a deep approach to learning, with its underlying intention to develop personal understanding. But, as mentioned in the lead paper, the specific processes within this approach necessarily vary across disciplines, due to the very different forms of knowledge, and the contrasting individual styles adopted by students in seeking understanding. Pask (1976a) distinguished between *holist* and *serialist* learning styles, with *versatile* students being those who were able to move readily between these two styles to develop their personal understandings. Holists prefer to look, first, for an overall idea of the topic, coming to details and supportive evidence later, while serialists prefer to build up their understanding step-by-step, keeping close to the facts within a logical progression. Not surprisingly therefore, science students depend more on serialist strategies within a deep approach, while humanities students show more tendency to be holists (Entwistle & Tait, 1995).

In his commentary, Michael Prosser's description of his own experience as a physics student suggest a serialist style, but also the reliance on learning facts and details that is essential to build up understanding in the sciences. And so, in his words, "the intertwining of memorisation and understanding is far more complex than is often envisaged". But there is an ambiguity in the meaning of 'memorisation'. It can refer simply to rote learning, which does play a part in coming to grips with technical terms or remembering details, or when the topic cannot be understood; but there is also the idea of

‘committing an understanding to memory’. In the interviews, students talked about rehearsing their understandings, sometimes by explaining it to an imaginary audience, and so strengthening confidence in their explanations. This process does involve strengthening the memory, but is far removed from rote learning, as we shall see later.

Michael also points out that important contrasts exist between cultures in the role that memorisation plays in developing academic understanding. Among Chinese students, specifically, initial reliance on rote memorisation is common, perhaps stemming in part from the need to memorise pictograms when learning to read and write. When faced with formal examinations, Chinese students tend to adopt what has been called *deep memorising*; the intention to understand is counteracted by an equally strong need to bring details to mind readily (Biggs & Tang, 2011). However, this tension is not just an Asian phenomenon; it occurs wherever this form of assessment is dominant and students perceive the need for the accurate reproduction of received knowledge. So how could the form of memorization involved in developing understanding be modelled?

Understanding involves a coherent web of interconnecting ideas and evidence

Given the extensive treatment of *knowledge objects* in the lead paper, it is hardly surprising that several commentators discussed the role they might play in developing personal understanding. Formal examinations do, in general, tend to encourage surface approaches, but the final examinations that provided the focus for the interviews reported in the lead paper were clearly perceived by the interviewees as demanding understanding, and this was the context in which knowledge objects were more consistently identified. They were not memorised to facilitate reproduction but, rather, they were used as mnemonic devices to allow a personal understanding to be brought to mind and used flexibly to answer the specific question set. As Peter Davies said, “The idea of a ‘knowledge object’ ... is defined as a conceptual structure which the learner has developed, which they can visualise, which pulls in relevant information, and which is also dynamic. *It becomes animated rather than being activated*” (italics added).

There is a sequence involved in the development and use of knowledge objects. They are created through an awareness of valid connections between ideas and their implications but, as one of the students said, “I think the facts are stored separately and the schematic, virtually a picture, is like an index”. The schematic within the knowledge object represents the interconnections, and the structure can be used flexibly to write essays or solve problems, and to pull in the related details, which may well have been learned by rote. That much is clear; but it is worth considering what is held in memory. The term ‘knowledge object’ implies that there is an actual object in memory that can be

used, but the students' descriptions of how it is used in writing essays or answering exam questions suggest that it is not an object as such, it is rather the logical steps within explanations that are remembered, and that the knowledge object is simply a mnemonic, held in visual memory, that brings to mind the steps in the argument. The link between visual memory and semantic memory has always been seen an important way of triggering knowledge from memory.

Alan Bainbridge sees a knowledge object from a psychoanalytic perspective as “a relational process between an individual and an object, that could be another person or even subject knowledge”, although with academic understanding, the emphasis is more on knowledge representation than on people. However, the fact that it can be applied to both perhaps strengthens support for the concept. And, as the next section explains, understanding does also develop through relationships.

Understanding develops through relationships with people and their ideas

The development of understanding is dependent on relationships and the language through which ideas are communicated and discussed between people, as both Hazel Francis and Alan Bainbridge made clear. This was recognized by one of the interviewees in saying that she was “getting to know the people that explain the ideas or data”, she even referred to them as her friends. For this reason, Hazel also stresses the importance in carrying out research into student learning, of “inviting students to report specific experiences in their academic context, whether this be a discipline, a course of study or, perhaps most usefully, a particular topic within one of these; always keeping in their reports the connection between understanding and the context of how and when it came about”. The interviews reported in the lead paper did, in fact, almost always contain discussions of specific essays or examinations, and the purpose was made clear, but the context did become lost in the subsequent attempt to see generalities, and even more so in selecting the indicative quotes for the lead paper. A case study approach would certainly be necessary to see understanding within the context of discipline and specific topic or task, and this approach has recently been used in two recent studies mentioned in the lead paper.

These studies bring more directly into focus both the ways in which understandings develop through the ‘inter-animation of different voices’ (Hay 2010), heard as students listen to their lecturers and tutors, and as they read researchers’ articles. For many disciplines this seems to be the most important way in which the interconnections between ideas are realized and built into a personal academic understanding; it is the inner experience of ‘reading for a degree’.

Another way of seeing the processes that take place in reaching an understanding can be seen, as Hazel reminds us, in Gordon Pask's work on *conversation theory* (Pask, 1976b). He argued that understanding comes from conversations with tutors (real and imaginary) and with oneself, as the ramifications of the topic are explored internally through the 'inter-animation of different voices'.

The emergence of a personal understanding depends on feelings and emotions as well as knowledge. When tutors show interest and offer support, there can be a *meeting of minds* in which cognitive and affective elements are intertwined in the student's experience (Karagiannopolou & Entwistle, under review). Conversely, when that support is not provided, students may retreat into surface strategies which, as Alan Bainbridge points out, **may reflect the actions of unconscious defences in which knowledge is not personally engaged with or thought about, remains the 'property of others' and so is not fully understood.**

Alan Bainbridge also reminds us that a students' feelings and attitudes to knowledge can be strongly influenced by their early experiences and their whole educational and personal history, and that "an understanding of understanding must consider the nature and role of ... archives of past patterns of behaviour" and that "learning is an existential and emotionally charged process". These are important issues that often get ignored in writings on educational psychology. Hazel Francis points out that the empirical methods typically employed in psychology are not designed to investigate a concept such as understanding, suggesting that "the problems of understanding others' understandings bedevil both conceptual and empirical analysis in psychology, yet understanding other understandings is central to learning from tutorial and text expositions and therefore to education". Here, the students' own purposes become important.

Understanding can be open or closed, with important educational consequences

The purposes that university students have in learning academic topics and theories are varied and sometimes, as we have seen, can lead to the tension created by opposites. For most students, the primary purpose is to fulfil course requirements and obtain a good degree, but many also want to understand the topics for themselves and expect what they have learned to be useful in a career and in everyday life. The lead paper suggested that students' personal understandings varied in their breadth, depth, and structure, but recent research has indicated that they also differ in terms being either 'open' or 'closed'. If the predominant motive is course completion, then surface approaches lead to a 'closed' form of understanding: there is no expectation that the understanding will extend, or be

used, after the university course is completed. But this is disastrous from the point of view of the academic who is trying to develop a way of thinking that will be indelible.

If teachers focus their attention on students being able to reproduce their knowledge from effective knowledge representations, their understandings are more likely to remain closed. As we saw in the lead paper, David Perkins (1998) and his colleagues suggested that understanding should be seen as a process, which could be developed through *understanding performances*. If students are given a series of tasks that focus on a specific understanding, completing those tasks will bring to bear the intellectual skills necessary to reach that understanding. But that may still result in a ‘closed’ form of understanding, which David has since described this as the *possession of knowledge*, with information or other people’s ideas being passively accepted (Perkins, 2008). This has to be contrasted with *performative understanding*, which still requires the possession of knowledge, but also involves the development of personal understanding. Finally, he described a ‘forward-looking’, *proactive understanding* that depends on progressively enhancing understandings into more complete and useful forms, ready to be applied in new situations.

In his commentary, David Perkins has introduced another set of categories to describe phases of understanding that map on to the three forms already described. Understanding can be seen, initially, as a topic to be understood, then as a tool to be used to explore other areas of knowledge or situations, and finally as a frame through which to view the world, which can also be seen as that ‘indelible way of thinking’ mentioned earlier. And this move towards ‘framing’ can be encouraged by making connections ‘outside the box’, making sure that understandings are connected, where possible, to broader issues and real world problems.

In all these analyses, David Perkins is looking at understanding specifically from an educational perspective, asking how can we help teachers to bring about academic understanding more effectively? We shall look at this aspect in our concluding section.

Understanding is often described with the help of metaphors

Each of our sections, so far, has been looking at a rather different aspect of understanding and we have seen how our commentators have been drawing on their own preferred theoretical perspectives, as well as personal experience, to consider the nature of academic understanding. In this section, we begin the process of bringing these ideas together by recognizing that attempts to describe understanding often seem to depend on the use of metaphors, which show this abstract concept in comparison to more concrete ones or everyday experience (Kövecses, 2010). So far, we have met, for example, webs,

tools, frames, archives, performances and conversations in order to understand understanding. The use of metaphors in this context is not surprising since metaphors underpin a good deal of our thinking and understanding, not just poetry and literature (Brown, 2003; Gibbs, Jr., 1994; Kövecses, 2010; Lakoff & Johnson 1980, 1999).

All understanding, whether of the world or even ourselves, depends on choosing the right metaphor. The metaphor we choose governs what we see. Even in talking about understanding we cannot escape metaphors. 'Grasping' things, for example, won't get us as far as we would like, because the most important things in life refuse to be grasped in either sense. Like Tantalus' grapes they retreat from the reaching hand. (McGilchrist, 2009, p. 179)

However, McGilchrist points out that choosing the 'right metaphor' for describing understanding is not easy.

[The fact] that knowledge comes from distinctions implies that we can come to an understanding of the nature of any one thing, whatever it might be, only by comparison with something else we already know, and by observing the similarities and differences. However, just as everything changes its nature, however slightly, when it changes its context, what we choose to compare a thing with determines what aspects of it will stand forward and which will recede. ... The model we choose to understand something determines what we find. If it is the case that our understanding is an *effect* of the metaphors we choose, it is also true that it is a *cause*: our understanding itself guides the choice of metaphors by which we understand it. The chosen metaphor is both cause and effect of the relationship. Thus how we think about our selves and our relationship to the world is already revealed in the metaphors we unconsciously choose to talk about it. Paradoxically we seem to be obliged to understand something - including ourselves - well enough to choose the appropriate model before we can understand it. Our first leap determines where we land. (p. 97)

And in this open dialogue, we have a number of 'first leaps' - and possibly second, third and so on. As noted at the beginning of this response, people bring different conceptual frameworks to the topic of understanding and the above suggests that these depend, in part at least, on choices of metaphor. Building on this way of thinking about metaphors, and applying it to science, Brown (2003) notes how large complex, scientific problems, such as global warming, involve multiple metaphors working on differing levels. Indeed, abstract concepts that are central to our lives are often described using a range of, sometimes conflicting, metaphors. This apparent incompatibility between metaphors is, perhaps, even necessary to aid understanding of complex, abstract concepts. And this will surely apply to understanding.

The lead paper and the responses are trying to work towards a coherent

understanding of something of which we ourselves have different experiences and which various forms of metaphor exemplify. Understanding, as we have seen, can be experienced as ‘closed’ or ‘open’. We may experience a moment when things become ‘clear’ and, as we saw in the lead paper, “ ‘jigsaw pieces’ suddenly connect and you can see the whole picture”. Or, we experience ourselves ‘mastering’ certain key concepts and moving across a ‘threshold’ into a whole new world of academic discourse. We could go through other metaphors used in this dialogue, but the point is that we will need multiple metaphors to develop a convincing description of academic understanding and the experiences associated with it.

The metaphors do, however, seem to form two broad groups. There are those that describe understanding as an event, a point in time when a particular outcome is achieved, associated with feelings about having done so. The associated emotions may be more or less intense, sometimes a ‘eureka experience’, often just satisfaction, but the focus is on the moment. The other group of metaphors implies that understanding is moving onwards, even though there are experiences of ‘*provisional wholeness*’ along the way. So, we master threshold concepts and pass through the threshold. We have an open understanding that leads us to further explore the topic. We have a tool (understanding) that we wield in certain performances to strengthen them, we then improve our dexterity in using the tool until it becomes something else – a frame for looking at certain aspects of the world in a more powerful way.

This Open Dialogue, taken as a whole, leads us to think that it is not a matter of trying to pin down understanding into one main perspective, but of how best to utilize a range of metaphors. We might learn something from the experience of others when dealing with similar concepts related to education. One example is *inquiry*. In a European Union funded project aimed at helping teachers to support their students’ learning through more inquiry-based experiences, some contributors moved from asking what inquiry is to what inquiry might be (Hoveid & Gray, forthcoming). Perhaps we also have to ask, “What might academic understanding be for differing individuals in contrasting contexts and at different educational stages?” And how can we best take account of this complexity, both in seeking to describe academic understanding and in considering how best to support it through teaching and supportive learning environments?

Supporting students in developing academic understandings

There has been a great deal of discussion recently about how best to encourage and support students’ understanding, and the discussion of the nature and experiences of academic understanding can be used to look at this in a rather different way. In the lead

paper, we recognized that the wide range of differences in subject matter and learning contexts make any specific implications for teaching wholly implausible, but it is possible to encourage teachers to think about the link between teaching and learning in importantly different ways. There has been a view, particularly from Government, that being a good university teacher was just a matter of having advanced knowledge and acquiring a set of techniques that would allow that knowledge to be conveyed to students. Research into teaching and learning in higher education has, however, shown how inadequate that idea is (Entwistle, 2009; Biggs & Tang, 2011). Teaching depends not just on having knowledge, but also on understanding how students learn. A sophisticated conception of learning is necessary if knowledge and good teaching techniques are to be used in ways that enable high quality learning to take place.

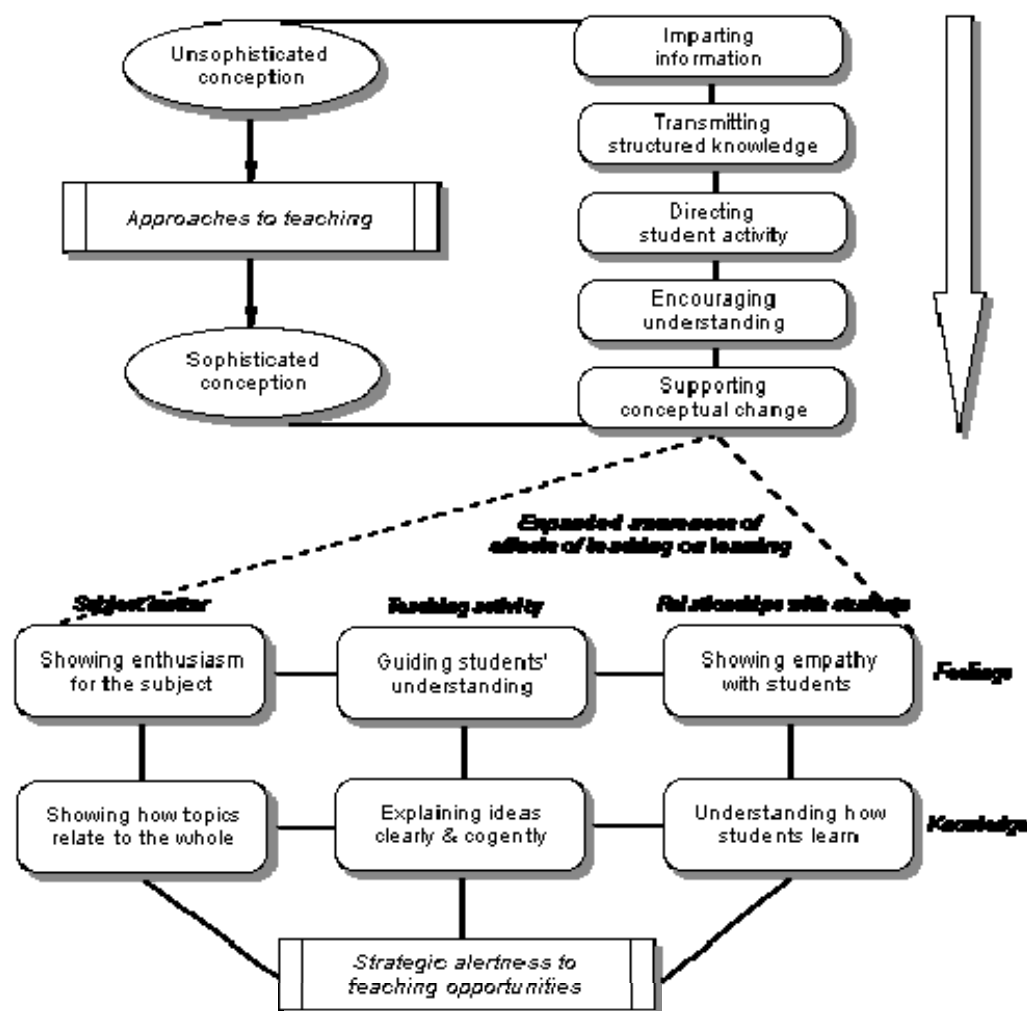


Figure 1 An expanding understanding of teaching and its main aspects (from Entwistle, 2009: 76)

Figure 1 summarizes the findings of various studies to suggest how university teachers develop increasingly powerful conceptions of teaching and learning, and what is

necessary, in general terms, for an approach to teaching that supports conceptual change. It draws attention to three main aspects on which good teaching and learning depend: the subject matter, the teaching activities, and the relationships with students. And each of these, in turn, depends on both knowledge and feelings. Knowledge is important, but so are feelings and intuition. Good teaching, importantly, depends on an *act of imagination*, being able to imagine what it is like not to understand the topic, and what steps are necessary to help students to grasp it. So the nature of an understanding of teaching becomes similar to that of an academic understanding for the student.

This dialogue has shown how our understanding of the nature of academic understanding depends on taking account of a range of overlapping perspectives, along with their multiple metaphors, that stress the intertwining of cognitive and affective aspects, and differing ways of using memory and learning strategies. The message for university teachers is that we must help students to become more aware of what is involved in acquiring a deep understanding of an academic discipline and to devise ways, appropriate to that discipline, which will promote and support the development of such understandings. In general terms, teachers can support students' understanding by coming to understand for themselves what is involved in reaching an understanding of the discipline they are teaching, and introducing students to some of the ideas and metaphors about memory, learning, and understanding that come from recent research findings.

What might that involve in practice? We want students to be able to recognize and understand the basic concepts and how they interconnect, so explanations of those concepts have to be made clear, often by addressing them in different ways and on repeated occasions, particularly when they are threshold concepts.

Concept maps can also have a key role. Just as students find 'knowledge objects' useful for remembering the main aspects of a topic and writing essays, so university teachers can use them to organize the teaching of a course or a topic. Creating a simplified concept map for a course can then be used as 'throughline' (Wiske, 1998) that provides a thread running through the course, allowing students to see how the topics inter-relate. Concept maps can also be used to plan individual lectures, thereby forming mnemonics for the lecturers, and also showing students how an expert envisages, and justifies, the inter-connections between concepts.

Lectures can also be used to exemplify the discourse of the discipline, how evidence is used and conclusions reached, and to point up the connections to real-world applications or current issues that may help students to use their own understandings

more broadly. This emphasis on understanding must also be carried through into the assessment procedures, as these are important ‘drivers’ of the approaches to learning used, and influence where effort is most conscientiously applied.

We also saw that academic understanding depends on conversations, with oneself and with others, and how a personal understanding can emerge from the inter-animation of the ideas met and through a ‘meeting of minds’ with supportive others, whether students or tutors. The role of tutors in encouraging students to seek an independent, critical understanding of topics cannot be overemphasized, as this also helps to build up self-confidence.

Others will, of course, see additional or alternative implications in what we, and our discussants, have mentioned, and that is to be welcomed as we seek to expand our understandings of this complex and multifaceted topic.

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