

Enhancing Learning Using Generic and Specific Aspects of Knowledge Formation

Peter Petocz

University of Technology, Sydney, Australia
Peter.Petocz@uts.edu.au

Anna Reid

Macquarie University, Sydney, Australia
Anna.Reid@mq.edu.au

Abstract: *Recognising and understanding the diverse ways that students learn is an important step in setting up effective environments for learning. A traditional way of getting this information is to observe the quality of assessed work and classroom interactions. An alternative and more direct method is to actually ask students to tell you about their own learning. While some students will be less successful than others in articulating their ideas, an overall picture will emerge of the variety of ways in which students understand what it means to learn. Such an approach has been used to investigate students' experience of learning in a variety of contexts. One practical effect of this line of enquiry has been the discovery of the dichotomy between teacher focused, content orientations to learning associated with a surface approach to learning and student focused, learning orientations associated with a deep approach to learning. These qualitatively different conceptions of learning result in discernible differences in learning outcomes. While some aspects of learning seem to be universal, others depend on the context of learning. In this paper, we look at two parallel studies of students' conceptions of learning in statistics and in music, areas quite different both in content and traditional methods of pedagogy. Research in these and other academic disciplines suggests that there is a strong relation between students' (and teachers') perception of professional work and their conceptions of their discipline and learning within that discipline. We discuss how this 'Professional Entity' is apparent in statistics and music, and how an appreciation of the Professional Entity can help teachers enhance their students' learning in other disciplines.*

Keywords: *Conceptions of learning; Professional practice; Statistics/music*

Introduction

A fundamental problem of education in any domain is recognising and understanding the diverse ways that students learn in that domain. Curriculum is often developed from the perspective of teachers' own specialisations or from department-wide discussion stemming from a recognition of 'niche' learning markets. These perspectives underpin a form of

curriculum that is focused on teacher knowledge and activities and in which students are often considered as passive recipients (eg, Baumslag, 2000). A traditional way of getting information on the quality of student learning in this paradigm is to observe the quality of students' assessed work and their classroom interactions. An alternate view of curriculum development focuses on students' learning needs (eg, Biggs, 1999). Recognition and understanding of the diverse ways that students learn within any domain is an important step in setting up an effective environment for student learning. Rather than examining student assessment outcomes or classroom interactions, an alternative and more direct method of finding out the range of variation in a class is to actually ask students to tell you about their own learning. While some students will be less successful than others in articulating their ideas, an overall picture will emerge of the variety of ways in which students understand what it means to learn in the specific domain. Bowden and Marton (1998, p18) suggest that:

Questions about knowledge formation in a certain domain of knowledge – whether disciplinary or professional – should be regarded as a part or aspect of that domain. It should be something that people in that field deal with and about which some of them develop specific interest and capabilities. It should be part of the studies of the domain as well – from the first introductory course to doctoral training. If this were to come true, questions about knowledge formation in different fields would become common topics of daily conversations, objects of systematic inquiry, a lever for raising the quality of learning on the individual and collective level.

Over the last 25 years, a number of studies have used such an approach to investigate students' experience of learning in a variety of contexts, and the results are summarised by Marton and Booth (1997). One practical effect of this line of enquiry has been the discovery of the dichotomy between teacher focused, content orientations to learning – associated with a surface approach to learning – and student focused, learning orientations – associated with a deep approach to learning. These qualitatively different conceptions of learning result in discernible differences in learning outcomes (Marton & Saljo, 1976; Kember, 1997). This research is well known and widely used in higher education circles, where summaries of such research, and their applications to the development of teaching quality, are used as texts for formal and informal courses in higher education (such as Ramsden, 1992; Prosser & Trigwell, 1998; Biggs, 1999). As an example, Marton, Beaty and Dall'Alba (1993) analysed a series of interviews with adult learners and identified the five conceptions of learning previously articulated by Saljo (1982) and found a sixth conception – learning as changing as a person. These six distinct conceptions of learning, were consistent with the surface and deep approaches previously identified.

But what about learning in specific subject areas? Academic staff developers are often confronted by academics who claim that "this is all very well, but it doesn't apply in my area!" While some aspects of learning seem to be universal (such as students adopting a deep or surface approach to their study), other aspects depend on the subject area and the context of the learning: Bowden and Marton (1998, p 18) claim that *"these aspects are likely to be able to be found within each field, and finding them is by far the most important step we all, within our various fields, can take towards dramatically improving the quality of learning at universities."* They suggest that it is important that 'knowledge formation' should be studied in context, *"finding out what is to be done in every field anew"* (p 281).

In this paper, we compare two parallel studies that have looked at students' conceptions of learning in statistics and in music, two areas quite different both in content and traditional methods of pedagogy: these studies have been presented previously by Petocz and Reid

(2001) and Reid (1997, 2001). While there are obvious differences between students' conceptions of learning in the two areas, there are also points of similarity. In particular, research in these and other academic disciplines suggests that there is a strong relation between students' (and teachers'!) perceptions of professional work and their conceptions of their discipline and learning within that discipline. We will discuss how this *Professional Entity* – a tripartite hierarchy of perceptions of the nature of professional work – is apparent in statistics and music. We will also discuss how academic staff developers can use the notion of the Professional Entity to help teachers enhance their students' learning in other disciplines.

Background to the statistics and music studies

Both of the studies (Petocz & Reid, 2001; Reid, 1997, 2001) were carried out by interviewing a number of students of the particular subject area (statistics or music) and analysing the interviews using a phenomenographic approach. The aim was to map out the range or variation in students' conceptions of learning in each of these fields.

The statistics students were first-year and third-year students enrolled in a degree in mathematical sciences. They were all studying statistics as a major part of their degree, with the aim of becoming professionals in the broad area of mathematical sciences, majoring in statistics or some other area of mathematics such as operations research. The first-year class was an introductory statistics class, while the third-year class focused on regression analysis. Both were taught in large groups (60–100 students) using a mixture of lectures, tutorials and computer laboratories.

In contrast, the music students were studying for a degree in musical performance with the intention of entering the musical profession. The students were selected from first to fourth year across a range of instrumental and vocal styles. In common with the standard pedagogic approach to music education at this level, each student received individual tuition handed down by an expert in their particular instrument or voice who themselves received tuition from an expert.

The result of each study was an "outcome space" of categories of conceptions of learning in that subject area. It is important to note that these categories are inclusive and hierarchical: they move from the most limited to the broadest. Students who typically describe the more inclusive conceptions can use characteristics of the less inclusive conceptions if their perception of the situation demands: the reverse, however, is not generally true (Reid, 1997).

Students' conceptions of learning statistics

Students' conceptions of learning statistics have been described in Petocz and Reid (2001). Here, we give a summary of the categories, but not quotes from the student transcripts to support them.

Conception A – Doing: learning in statistics is doing required activities in order to pass or do well in assessments or exams. Here, students focus on activities they have to do as part of their subject, which they think is sufficient to pass. They approach their study by attending lectures, reading, doing labs, repeating questions or examples until there are no mistakes, or doing previous exam papers. They aim simply to do well in assessment tasks and the exam.

Conception B – Collecting: learning in statistics is collecting methods and information for later use. Here, students focus on gathering information, absorbing methods, increasing knowledge, and stockpiling examples or ideas. Students with this conception understand statistics to be about a group of techniques that need to be acquired in order to be used 'later'.

Conception C – Applying: learning in statistics is about applying statistical methods in order to understand Statistics. Here, students believe that doing practical activities provided will enable them to understand the subject of Statistics. They focus on doing practical things like examples, checking results and getting problems correct. The students' intention for their learning is to understand of the subject Statistics.

Conception D – Linking: learning in statistics is linking statistical theory and practice in order to understand Statistics. This conception focuses on linking theory with practice. Students intend to find out how the practical exercises can inform their understanding of statistical theory, and vice versa. Students describe an intention to use statistics in 'real life' situations and they enjoy trying out their ideas on 'real' data.

Conception E – Expanding: learning in statistics is using statistical concepts in order to understand areas beyond Statistics. Here, students intend to connect statistical concepts with other areas. They aim to understand what they are doing, the meaning of data summaries, the broad subject area, and the real world meaning of what they are doing with numbers. They can see how statistics can be used outside the subject area or even outside the university context.

Conception F – Changing: learning in statistics is about using statistical concepts in order to change your views. This is the most expansive and inclusive conception. Students focus on the changing quality of their own understanding of the broad idea of statistics and of the world. They see statistics as an intellectual tool that can be used to inform their understanding of many other areas, or to solve problems in other areas. They believe that their study of Statistics pushes them to change the way they view the world.

Students' conceptions of learning music

Students' conceptions of learning music have been described in Reid (1997, 2001). Here, we give only a summary of the conceptions, without any quotes from student transcripts to support them.

Conception 1 – Learning an instrument or voice. In this conception students focus on acquiring the technical skills required of the instrument. They approach their study by rehearsing repetitive physical actions using studies and scales. The outcome of their study is the demonstration of technical skills in an exam situation.

Conception 2 – Learning an instrument or voice and some elements . Here, students focus on the acquisition of technical skills and some musical elements. Written music is seen as a series of individual technical problems that must be solved. Once technical solutions have been found musical elements, such as phrasing or dynamics, are added. The outcome of the learning experience is technical proficiency in an exam situation.

Conception 3 – Learning musical meaning. Here, students reflect on their teachers' advice on technique and stylistic interpretation of music. Technical proficiency on the instrument is

seen as a vehicle to enable correct playing of the music. The outcome of the learning experience is to be able to play the music with correct technique and musical style in a performance situation.

Conception 4 – Learning to communicate musical meaning. In this category students see music as a means of communicating with an audience. Written music has an implicit meaning that is expressed by the student using the instrument as a medium. Technique is seen only as a tool through which musical meaning is expressed. The intended outcome of the learning experience is to express the implicit musical meaning of a work to an audience.

Conception 5 – Learning to express personal meaning. Here students see learning as reflecting on musical knowledge and assimilating musical ideas into a performance that communicates with the audience and expresses personal meaning. The instrument is seen as a vehicle of self expression which is subject to the greater need to express personal meaning through the music. The intended outcome of the learning experience is to communicate personal meaning and interpretation of the music to an audience through performance.

Comparing conceptions of learning statistics and music

The two sets of categories describing students' conceptions of learning in statistics and music show that there are some similar aspects, and some aspects that are quite different. Both outcome spaces demonstrate a hierarchy of increasing inclusivity and sophistication. The limiting and least inclusive conceptions in each case show that some students see learning as focusing on repetitive practical tasks with an exam orientation. The more inclusive and holistic conceptions of learning have the similarity that students merge their personal views with ideas about the subject to form views that are intrinsic and move beyond an institutional setting.

It is in the area of dissimilarity that we can see the effect of disciplinary difference. A question fundamental to the nature of the dissimilarities is "what is the purpose of statistics or music?" Music is an art where the basic aim of the discipline is to express something musical to others. Statistics is perceived to be a science where the basic aim of the discipline is to use its methods to elucidate the important features of a situation. In both cases the limiting conceptions of learning are focused on acquiring something. In statistics, the acquisition of statistical tools is not necessarily related to the students' understanding of statistics. In music, the limiting conceptions are still focused on acquisition of techniques, but these techniques are very clearly related to a specific musical genre or instrument.

At the intermediate levels, statistics students aim to understand the subject for themselves, music students aim to communicate the subject's meaning to others. At the most integrated and sophisticated levels, statistics students indicate that learning is about changing the way they themselves understand and world through the use of statistics. By contrast, music students aim to convey a personal story mediated through the music's meaning to an audience. At all levels, there appear to be distinct disciplinary differences and this variation can account for the subtle differences in the ways students state their understanding of learning.

It is apparent that what we teach in an institutional context is not inevitably what students learn, and the intentions and outcomes of student learning are not inevitably those that we state in our curriculum objectives. The conceptions of learning expressed by the students in

these two parallel studies indicate that there is something beyond the world of institutional learning that provides other intentions for student learning. The music students (and their teachers – see Reid, 1997) all linked their instrumental or vocal learning with a perception of their future work environment. The relations between learning and work were so apparent there that in the statistics study the authors included explicit questions about the relations between learning and perception of work (and since then also in the areas of design and law). These research projects have uncovered a series of relations between students' conceptions of learning and their perceptions of work. We have called this relation the *Professional Entity*.

The Professional Entity

The research of Prosser and Trigwell (1998), Kember (1997), Biggs (1999) has established that there is a relation between students' perceptions of their learning situation and the ways in which students then go about their study. Other studies have linked this with student' ideas about their subject (eg Entwistle & Marton, 1994; Crawford *et al*, 1994; Petocz & Reid, 2001), It is also apparent that students experience learning in their own domain of study in ways that may be interpreted as similar across fields of study – and at the same time in ways that are quite different. Our research has also shown that there is a relation between students' perceptions of their future work and the way they go about learning, and that this perception of work may be generic across disciplines. This relation – the Professional Entity – comprises three levels of understanding the nature of professional work, Extrinsic Technical, Extrinsic Meaning and Intrinsic Meaning.

Reid (1997) first articulated this relation in her work with musicians and their students, describing the *Music Entity*. Reid (1999) wrote that:

The identification of the Music Entity as an experience of the professional world that is related to teaching and learning suggests that the constitution of categories of description of phenomenon in future studies needs to be reconsidered. This reconsideration would reflect the relation of the group's experience of the professional world and the relation an awareness of this world may have with teaching and learning in associated disciplines.

The significance of the experienced world as expressed through the Music Entity is that conceptions of teaching and learning exist within a rich multi-dimensional framework. Further research in theology (Morgan, 1999), design (Davies & Reid, 2000), statistics (Petocz & Reid, 2001) and law (Reid, Nagarajan & Dortins, in preparation) lends support to the idea that the Music Entity is a manifestation of the broader concept of the Professional Entity, as the same three qualitatively different ways of understanding the nature of work seem evident in a variety of fields.

The Extrinsic Technical level describes a perception that professional work is constituted as a group of technical components that can be used when the work situation demands it. In statistics this was manifested as the gathering of statistical techniques (Conceptions A and B) and in music as a group of instrumental techniques and musical elements (Conceptions 1 and 2). A characteristic of this limiting view is that professional work simply exists, and is experienced as being quite external to the individual.

The Extrinsic Meaning level describes a perception that professional work is about developing the meaning inherent in discipline objects. In this sense, statistics students

examined the meaning found in a set of data (Conceptions C, D and E) and music students indicated that musical manuscript is full of historical and stylistic meaning that needs to be discovered and accurately reproduced (Conceptions 3 and 4).

The broadest level of the Professional Entity is the Intrinsic Meaning level. In this view, people perceive that their professional work is related to their own personal and professional being. This means that statistics students create and develop their view of the world by testing their understanding of the world with statistical evidence in the form of data (Conception F), while music students see the instrument, the manuscript and the performance as a means of communicating their own story or feeling to an audience (Conception 5).

If we look at these different disciplines – statistics and music – and the Professional Entity, we can see that while the broad descriptor is constant, the specific meaning of each level is defined by the discipline. In the context of this paper we have focused our description of the Professional Entity from the perspective of our statistics and music students. However the same tripartite hierarchy is evident in our research into other areas. This leads us to postulate that while the specific detail of the nature of the Entity is different in each domain (like the conceptions of learning), that there is also an underlying stability about the perception of professional work that is related to students' conceptions of learning. Thus, the Professional Entity is an over-arching framework that relates students' and teachers' understanding of their subject and their perceptions of professional work in their area. Its identification enables an interdisciplinary approach to the learning and teaching that is a preparation for professional work in music, statistics or other areas.

Understanding the nature of the Professional Entity in every learning domain is critical. The research studies cited suggest that there is a very close relation between the way that teachers and students perceive the profession and what they then think is critical to either teach or learn. An awareness of the Professional Entity can be important when materials for learning are being developed. Reid and Petocz (2001) have described the relation between the Professional Entity in the context of solo and ensemble music and the development of the multi-media package *Creating Ensemble* (Blom *et al.*, 1998). In that package, the three levels of the Entity were explored through suggestions for student activity and the visual and audio representation of music. In this way, students were encouraged to examine their own beliefs about the nature of professional music-making and were made aware of the more integrated Intrinsic Meaning category. We suggest that an awareness and exploration of the Professional Entity in the context of all learning domains will provide a similar basis for the development of learning materials and curriculum to that of music.

Implications for academic staff development

In previous studies, Reid (1997, 2001) has shown that there are strong relations between teachers' conceptions of their discipline and the way that they go about teaching. Importantly, she also showed that the way that teachers carry out their teaching, and the sort of learning environment that they set up in their classes, can encourage those students who identify with the lower, fragmented levels to engage with their learning at a higher level: however, this can also work the other way, if a teacher sets students tasks that are best carried out using the more fragmented conceptions of learning (Reid, 2000). This highlights the crucial role of the teacher's conceptions in the learning process. We often assume that teachers share an understanding of at least the subject material. The research by Reid (1997) on musicians'

conceptions of teaching and learning music would suggest otherwise: it indicates that professional musicians who also teach have a wide range of ways that they understand music as part of a work environment. It shows how their experience becomes part of their teaching profile and their expectations for their students' learning. Not surprisingly, the musician/teacher's experience of work is expressed to their students through the activities that they work on together. These ideas lead us to some important implications for academic development.

The existence of the Professional Entity that has been established in the areas mentioned in this paper indicates that it may be present in other areas and the particular disciplinary flavour needs to be discovered. Academic developers could use the Professional Entity as an important point of contact with academics from other areas. The generic idea of the Professional Entity could be used within a 'workshop' situation to postulate how it may be manifested in other professional areas such as, say, tourism and leisure studies, engineering, dentistry or actuarial studies. Of course, the predictions should then be followed up by studies to test them, and this may be another opportunity for collaboration between academic staff developers – experts in 'knowledge formation' – and academics in the area.

Conceptions of learning in each learning domain need to be clearly articulated, and if this information is used in classes it can lead to immediate changes in the institutional learning environment by encouraging students to see beyond limiting ideas about their discipline toward holistic and integrated ideas. The conceptions of learning in any subject need to be grounded in perceptions of work where Intrinsic Meaning is favoured, as this idea helps students to focus on making meaning of their own professional future through their current institutional situation. Teachers need to be made aware of the variety of learning conceptions and perceptions of work that are apparent in their own discipline and this may be encouraged through active research projects focusing on student learning.

Research on student learning and perceptions of work needs to be considered as a valued scholarly activity by institutions of higher education and that such research has personal benefits for the teacher as it provides a way of being critical about the nature of teaching improvements and changes within their own discipline. This will lead to the continued development of learning and teaching quality. As Bowden and Marton (1998, p 282) put it:

Ways of seeing have to be found, revealed, discovered, and doing so is well on a par with any research achievement. It is, in fact, a major research achievement and also the key to better learning.

With this approach, the development of learning materials would be grounded in the more integrated and holistic conceptions of learning in any domain and learning activities and assessments would be specifically targeted to encourage the development of the expansive conceptions of the domain. This strategy would enhance the general learning and teaching quality of institutions of higher education, provide an avenue for scholarly discourse about learning, link learning and teaching experiences to the general professional world that most of our students will be entering, and enable academics to integrate scholarly research on teaching and learning within every teaching and learning activity.

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Dr Peter Petocz is a statistician and senior lecturer in the Department of Mathematical Sciences at the University of Technology, Sydney. His research interests include statistics education and applied statistics. He has been interested in and active in the area of educational

development for most of his career, first as a practicing teacher working with informally and formally with individual colleagues and teaching teams, and then from the point of view of research into conceptions of student learning.

Dr Anna Reid is a senior lecturer in the Centre for Professional Development, Macquarie University, Sydney. She has focused on the areas of learning and teaching in higher education, where she has been involved with the development of formal and informal professional development academic staff, research in higher education in conceptions of teaching and learning, group work, work-based learning, flexible learning, assessment and evaluation, environmental sustainability and internationalisation. Another area of her interest is academic leadership, working with several university wide committees and implementing and evaluating strategic initiatives within faculties.