Abstract

The study to be reported here extends the current understanding of epistemological beliefs by taking into account another set of beliefs related to learning that have often been overlooked. This study, basing on empirical data collected via semi-structured interviews from 29 student teachers in Australia, examines how core beliefs about knowing are related to peripheral beliefs about learning. A theoretical framework is developed for considering these beliefs about knowing in relation to beliefs about learning as an overall set of epistemological beliefs - such links between the developmental epistemological beliefs and student learning research have not been made in the literature to date. As a group, it is found, students’ beliefs about knowing ranged from a focus on knowledge as absolute and received to a view that knowledge was constructed and reasoned. The categories related to learning reflected a range of beliefs from reproductive through to more transformative beliefs about learning. A relationship was noted between the more sophisticated beliefs about knowing and transformative beliefs about learning. Implications are discussed.

INTRODUCTION

Since the 1970s, research on the nature and acquisition of knowledge (Bendixen, Dunkle, & Schraw, 1994) has contributed a great deal to our understanding of how beliefs about learning influence the approaches to, and in
turn the effectiveness of learning. Currently, a substantial body of research also indicates that teacher educators may also need to focus on a related, but somewhat different set of beliefs in order to facilitate student-teachers’ learning. To address this critical need, empirical data should be generated, with the data collection and analysis guided by a theoretical framework.

The study to be reported here is to help fill the knowledge gap by extending the current understanding of epistemological beliefs by taking into account another set of beliefs related to learning that have often been overlooked. This study, basing on empirical data collected in Australia, examines how core beliefs about knowing are related to peripheral beliefs about learning. A unique feature of this report is that of the presentation of a theoretical framework for considering these beliefs about knowing in relation to beliefs about learning as an overall set of epistemological beliefs. Such links between the developmental epistemological beliefs and student learning research have not been made in the literature to date.

THEORETICAL FRAMEWORK

The following paragraphs will firstly overview the literature related to developmental epistemological beliefs and then present a framework for considering these beliefs about knowing in relation to beliefs about learning as an overall set of epistemological beliefs. Such links between the developmental epistemological beliefs and student learning research have not been made in the literature to date. This review will make such links by using a core-periphery beliefs framework (Brownlee, 1996). Hofer and Pintrich (1997) also described a similar framework whereby epistemological beliefs are considered to comprise both core beliefs about knowing and peripheral beliefs about learning and teaching. Developmental epistemological beliefs may be described as core beliefs, which filter other knowledge and beliefs (Posner, Strike, Hewson, & Gertzog, 1982). The more a belief is connected with other beliefs within the belief system, the more central the belief (core) and the more impervious to change (Bem, 1970; Nisbett & Ross, 1980; Pajares, 1992; Peterman, 1991; Rokeach, 1968).

This review will make such links by using a core-periphery beliefs framework (Brownlee, 1996). Hofer and Pintrich (1997) also described a similar framework whereby epistemological beliefs are considered to comprise both core beliefs about knowing and peripheral beliefs about learning and teaching.
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Shaver (1992) described epistemological belief systems as “epistemologies-as-knowledge building” (p.19). Core beliefs about knowing reflect a person’s beliefs about what knowledge is, how it can be gained, its degree of certainty, and the limits and criteria for determining knowledge (Perry, 1981). Epistemologies-as-learning (Shaver, 1992) are considered to be beliefs about individual learning which constitute more peripheral beliefs within the epistemological beliefs system. This means that beliefs related to individual learning, such as learning strategies, influences on learning and conceptions of learning are more likely to change depending on the particular learning context. These beliefs are reflected in the student learning literature: for example, conceptions of learning (see Marton & Säljö, 1976; Säljö, 1979; Marton, Dall’Alba, & Beatty, 1993; Marton, Watkins, & Tang, 1995), approaches to learning (see Biggs, 1985, 1992; Entwistle, 1998), and learning outcomes (see Biggs, 1989; Marton & Säljö, 1976). Core beliefs about knowing and peripheral beliefs about learning will now be discussed respectively with the intention of drawing links between the two literatures.

**Developmental Epistemological Beliefs: Core Beliefs about Knowing**


Probably one of the most influential researchers in the area of epistemological beliefs was William Perry (1970). Perry noticed that Harvard liberal arts students moved through four main positions, which he described as dualism, multiplism, relativism, and commitment. Individuals who hold dualistic views about the nature of knowledge believe that absolute truths (right/wrong) exist and can be transmitted to an individual from an authority or expert. Next, when individuals begin to conceive of knowledge in a multiplistic way, they concede...
that as well as absolute truths, there are some things that cannot be known with any certainty. Such individuals therefore believe that knowledge comprises both personal opinions and ultimate truths. They rely less on authorities for absolute truths, however personal opinions and truths are still considered to be “right” or “wrong.” The next position, relativism, constitutes a major shift in epistemological thinking because now individuals consider that knowledge is actively and personally constructed, although initially this may occur in some contexts only. Absolute truths can no longer exist because truth is considered to be relative to individuals’ personal interpretations of experiences. In the final positions of commitment, relativistic thinking is still a feature, but now particular beliefs are more valued than others and are committed to in a flexible manner.

Although these positions were not intended to focus on specific gender issues, they were derived using male Harvard students. Belenky et al. (1986) have described a similar sequence of epistemological development with a specific focus on female participants. Belenky et al. (1986) traced the development of epistemological beliefs by interviewing 135 women from academic and non-academic backgrounds. The women were asked to respond to a number of open-ended questions, which were intended to reflect moral, cognitive and identity development. Belenky et al. (1986) postulated five stages in the development of epistemological beliefs, which closely align with those described by Perry (1981). These include received (dualism), subjective (multiplism), procedural (relativism) and constructed (commitment) ways of knowing. Baxter Magolda (1993) also described four stages of epistemological development that suggested changes in terms of complexity and reflective thinking similar to those described by Perry (1981) and Belenky et al. (1986). However, within each of these stages she described beliefs about knowing that included ways of knowing typical of both genders.

These developmental perspectives of epistemological beliefs have been criticized for their stage-like, unidimensional characteristics. Building on the work of Perry and others, Schommer (1998) conceived of epistemological perspectives as more than a unidimensional set of beliefs that developed over time. Over a series of studies, she described such views as a multidimensional set of more or less independent beliefs (Schommer 1990, 1993a, 1993b). This means that individuals may hold both sophisticated (more relativistic) and naïve (more dualistic) views about the nature of knowing. Schommer (1989, 1990, 1993a, 1993b) described five dimensions of epistemological beliefs that
included (a) “omniscient authority” (beliefs in the source of knowledge), (b) “certain knowledge” (beliefs in the certainty of knowledge), (c) “simple knowledge” (beliefs in structure of knowledge), (d) “quick learning” (beliefs in the speed of learning), and (e) “innate ability” (beliefs in the stability of knowledge) (Schommer, 1990). In a questionnaire developed by Schommer over a series of studies (1989, 1990, 1993a, 1993b) four of these five dimensions have emerged as factors. These are “certain knowledge,” “simple knowledge,” “quick learning,” and “innate ability.”

More recently, Schommer (1994) has conceptualised such beliefs as a kind of frequency distribution where, for example, sophisticated learners may believe a vast amount of knowledge is evolving, some knowledge is yet to be discovered, and a very small amount of knowledge is unchanging. On the other hand, naïve learners may believe a vast amount of information is certain, some knowledge is yet to be discovered, and a very small amount of knowledge is changing. (Schommer, 1994, p.302). This multiplicity of dimensions means “that epistemological beliefs do not necessarily develop in synchrony” (Schommer, 1994, p.302) and that learning may in fact be determined by individual as well as a combination of beliefs.

Schommer’s research (see, for example, Schommer & Walker, 1995) has shown that epistemological beliefs may be generalisable across domains rather than domain specific. This centrality has also been recognised in individuals’ epistemological beliefs in reflective judgment research (King & Kitchener, 1994). Conversely, Mori (1997) believed that core beliefs about knowing are context specific. He examined the link between general epistemological beliefs and epistemological beliefs related to language learning in 97 college students who were learning Japanese and found that mostly these two dimensions were uncorrelated and independent of each other. Sheese and Radovanovic (1984), Beers (1988), and Roth and Roychoudhury (1994) similarly reported that epistemological beliefs are more likely to be context specific.

A third perspective in this debate might also be considered. Ruddick (1996) claimed that epistemological beliefs can be described as both generalised and context specific. She postulated that people have different core epistemological beliefs in different contexts and yet conceded that “prolonged focus on any of these kinds of inquiries may well produce cognitive capacities and attitudes that recur to different degrees in epistemologically dissimilar contexts” (pp. 254-255). This means that, while epistemological beliefs may be context
specific, it is also possible that they may be held across a range of contexts, giving the impression that they are generalizable. The debate regarding context-specific versus generalised ways of knowing is ongoing and in need of further discussion (Hofer & Pintrich, 1997). However, in the current study, a focus will be maintained on generalised epistemological beliefs, whilst acknowledging the possibility of some context specific beliefs.

**Student Learning Research: Peripheral Beliefs about Learning**

Epistemologies-as-learning are considered to be beliefs about individual learning and teaching which constitute the more peripheral beliefs within the epistemological belief system (cf. Hofer & Pintrich, 1997; Shaver, 1992). This means that such beliefs are more likely to be changeable and context specific. Therefore, beliefs about learning/teaching strategies, influences on learning/teaching and conceptions of learning/teaching are more likely to change depending on the particular learning task. The current study is focussed on conceptions of learning, learning strategies, and perceptions of learning outcomes as peripheral beliefs about learning from a student learning research perspective.

In Sweden in the 1970s, the student learning research tradition was beginning to emerge. In particular, early work focussed on conceptions of learning and the implications for approaches to learning. Marton and Säljö’s (1976) work showed that surface approaches to learning, such as memorising text, were linked to reproductive views of learning in that context. Conversely, meaningful processing of the text (Marton & Säljö, 1976), or deep approaches to learning, were linked to beliefs that learning was a meaning making process.

At about the same time as Marton and Säljö (1976) were investigating students conceptions of learning, Perry (1970) and his colleagues in the United States were researching the nature of student learning from an epistemological beliefs perspective. In fact, it could be suggested that Perry’s research provided the first real indication of a developmental perspective of conceptions of learning (Purdie & Hattie, 1997). Although his work was concerned specifically with students’ views of knowledge and knowing, the implications for conceptions of learning in tertiary learning contexts have been extrapolated. For example, students with more dualistic beliefs about knowing are less likely to engage in higher order thinking (Beers, 1984) and less likely to relate comprehension to understanding and application (Ryan, 1984a).
Until now, however, there has been no systematic linking of the two research perspectives. To be overviewed here are conceptions of learning and postulate links between these peripheral beliefs about learning and core beliefs about knowing.

Marton et al. (1993), building on Säljö’s (1979) conceptions of learning, found that Social Science students at the Open University in Britain experienced learning in six qualitatively different ways. These are almost identical to those of Säljö’s conceptions (1979) except for the sixth conception, which represents an existential extension of the fifth conception. The conceptions included (a) Increasing one’s knowledge (b) Memorising and reproducing (c) Applying (d) Understanding (e) Seeing something in a different way and (f) Changing as a person.

There are two fundamental differences between these six conceptions of learning. The first involves how knowledge can be gained (Wilkinson, 1989). In the quantitative conceptions (a), (b), and (c) the learner has the intention to acquire external knowledge through transmission of knowledge from an authority, which often results in a surface approach to learning. When students adopt a surface approach they may have a failure avoiding intention and use strategies that complement this motivation such as rote learning (Biggs, 1985). A dualistic epistemological orientation to knowledge can be described similarly in terms of categorical, unreflective thinking that is transmitted by an external source (cf. Baxter Magolda, 1993; Belenky et al, 1986; and Perry, 1981). Considering the filtering role of beliefs about knowing, it is possible that dualistic core beliefs are likely to determine the quantitative beliefs about learning described by Marton et al. (1993). Students with such beliefs are not likely to consider they are responsible for actively developing personal meaning and are more likely to engage in surface approaches to learning.

The qualitative conceptions (d), (e), and (f) describe beliefs in learning as a process of active transformation of knowledge by the individual to extract meaning from the learning task. Such beliefs are more likely to influence the use of deep approaches to learning where the learner has the intention to gain personal meaning and uses strategies that complement this intention by making links with prior knowledge (Biggs, 1985). Core beliefs about knowing that are relativistic in nature may influence these qualitative beliefs about learning.
Students with such core beliefs take responsibility for actively reflecting on and transforming information to develop personal meaning.

The second major difference relates to the nature of what is learnt (Wilkinson, 1989) or the structure and certainty of knowledge. Individuals with quantitative beliefs about learning, according to Marton et al. (1993), view knowledge as discrete elements (structure) existing “out there” (certainty of knowledge) that can be absorbed without transformation. Conversely, the qualitative conceptions reflect beliefs that knowledge is complex or interconnected and relative to particular learning tasks (not absolute). Again, such views of learning seem to reflect the dualistic-relativistic perspectives of knowing made by Baxter Magolda (1993), Belenky et al. (1986), and Perry (1981) regarding beliefs about knowing.

There is evidence to suggest that many first year student teachers may hold beliefs that learning and teaching involve a process of transmitting information from the teacher to the learner (Lawrence, 1992). This could be considered to be a quantitative view of learning. When individuals hold such beliefs they are more likely to adopt surface approaches to learning (Marton & Säljö, 1976; Säljö, 1979) which are considered to result in fragmented learning outcomes (Marton & Säljö, 1976). Therefore, preservice teacher education students may need to be encouraged to develop transformative beliefs about learning and teaching. This means that active engagement is required in the process of making meaning both in terms of their own learning and that of the students for whom they will be responsible. This review has suggested that such beliefs about learning and teaching form part of a broader set of beliefs known as epistemological beliefs. Therefore, core beliefs about knowing as described by Perry (1970), Belenky et al. (1986) and Baxter Magolda (1993) may need to be considered when providing teacher education programs that are focused on developing teacher beliefs.

THE STUDY

With reference to the theoretical tenants presented above, the study to be reported here was conducted to investigate the nature of epistemological beliefs, in particular the relationship between core and peripheral epistemological beliefs, in preservice teacher education students.
The students in this study were undertaking a Graduate Diploma in Education (primary). This was a one-year course that prepared individuals with undergraduate degrees to teach in primary schools in Queensland, Australia. Students came from a variety of disciplines in their undergraduate degrees including Business, Social Science, Leisure Management, Psychology, Visual and Performing Arts, Science, Literature, and Nursing. There were 3 males and 26 females with a mean age of 27.65 years.

The qualitative data reported on here was collected at the end of the one-year course using a semi-structured interview format. The interviews took between 30 and 70 minutes with an average of about 60 minutes in duration. They were audio-taped and transcribed verbatim. The questions used related to beliefs about knowing which were similar to those used by Belenky et al. (1986) in their study of women’s epistemological beliefs. Students were also asked to describe their beliefs about learning using similar questions to those used in the T&LiTE Project (1994). Table 1 records the details of interview questions.

Analysis of the qualitative data was conducted using a predominantly inductive approach, which drew on relevant literature to interpret responses. This descriptive—interpretative approach to analysis still made it possible to take account of many viewpoints before deriving theory (cf. Maykut & Morehouse, 1994). The categories that emerged were audited by a second inquirer to establish trustworthiness and credibility (Lincoln & Guba, 1985). QSR NUD*IST (Non-numerical Unstructured Data Indexing Searching and Theorising) (Richards & Richards, 1994) was used to assist in the organization of data emerging from the transcriptions of the audiotapes.

Table 1

<table>
<thead>
<tr>
<th>Beliefs About Knowing Interview Questions</th>
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<tbody>
<tr>
<td>• How do you know when you know something? Sometimes people talk about “searching for truth.” I’m not sure what they’re talking about. What are your views? In learning about something you really want to know, what is the role of an expert?</td>
</tr>
<tr>
<td>• Probes</td>
</tr>
<tr>
<td>• How do you know someone is an expert? What do you feel and what do you do when experts disagree? What do you do if lecturers disagree?</td>
</tr>
<tr>
<td>• If experts disagree on something today, do you think that some day they will come to some agreement? Why or why not? How do you know what is right/true?</td>
</tr>
<tr>
<td>• Do you agree with this person who says that where there are no right answers</td>
</tr>
</tbody>
</table>
anybody’s opinion is as good as another’s? Can you think of an opinion that you think is wrong?

**Beliefs About Learning**

- What is learning?
- How do you go about learning in general?
- What strategies do you use?
- How do you know when you have learnt something?

**FINDINGS**

The findings from this study are presented in three main sections. The first two sections are descriptions of the categories of beliefs about knowing and learning respectively. In the final section, the relationship between beliefs about knowing and beliefs about learning is explored.

**Beliefs about Knowing**

A developmental constructivist perspective is used as the framework for the analysis of students’ responses related to beliefs about knowing. From a developmental view of constructivism, individuals are considered to both socially and individually construct knowledge (Mahoney, 1996). This means that individual autonomy (radical constructivism) and social interrelationships (social constructionism) are both considered important in the construction of knowledge. Essentially, when using a developmental constructivist framework, one can justify the use of developmental epistemological schemes that do not totally hold that all knowledge is socially constructed or that all knowledge is idiosyncratic. It acknowledges the role of both context and individual interpretation from a developmental perspective.

Overall, the comments made by students regarding their core beliefs about knowing could be divided into four main categories: construct reasoned truths (CON), construct reasoned truths and receive absolute truths (INCONSISTENT, CONREC), and receive absolute truths (REC) beliefs. These categories are described and exemplified in Table 2. In the context of this study, these core beliefs about knowing mostly refer to an individual’s dominant or default beliefs within an academic context. Students were asked to comment on their beliefs about knowing in a global manner. Therefore, it was expected that responses that were not focused on a specific domain of knowledge would be indicative of their default or dominant core beliefs about knowing. The examples provided in Table 2 show that from the category of
REC beliefs through to the category of CON beliefs, there is an increase in focus on beliefs that truth is constructed and reasoned and corresponding decrease in focus on truths as absolute and received. REC beliefs present the most naïve perspective because individuals describe truths as received and absolute only. In the next category, CONREC beliefs, students believe that some truths are constructed and reasoned. However, these students still have a strong focus on core beliefs in the reception of absolute truths throughout their interviews.

Table 2
*Descriptions and exemplars for categories of core beliefs about knowing*

<table>
<thead>
<tr>
<th>Categories</th>
<th>Descriptions</th>
<th>Example statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct reasoned truths CON</td>
<td><em>How:</em> individuals construct personal truths that are supported with evidence; this means that individuals actively create their own truths rather than passively receive truths that are a direct representation of reality. Experts facilitate the construction of reasoned truths.</td>
<td>I think that is all tied in with my beliefs on not being an absolute right or an absolute wrong and people are entitled to their own opinions as long as their opinions are valid, are reasoned out, they are not just an opinion off the top of their head. They have actually reasoned out their opinions and said well I think it is because of such and such so I think knowledge is a very personal thing as well. (52)</td>
</tr>
<tr>
<td></td>
<td><em>What:</em> individuals have opinions that are reasoned hence some opinions are better than others because they are informed by current research and experience; the CON-T beliefs in this category represent an overarching, differentiated structure that integrates all of an individual's beliefs about the nature of truth.</td>
<td>I still think that ... there are some things that are, you know obviously true, maybe like some of the maths, like some things are black and white but generally truth still for me comes from taking what is around you and putting your own interpretation on lots of things, so I guess listening to other people and making some judgements I suppose about what you believe about that. (32)</td>
</tr>
<tr>
<td>Construct reasoned truths and receive absolute truths INCONSISTENT CONREC</td>
<td><em>How:</em> individuals construct personal truths that are supported with evidence and individuals receive absolute (right/wrong and universal) truths from an external source; this means that individuals actively create their own truths and passively receive truths that are a direct representation of reality. Experts facilitate the reception of absolute truths.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>What:</em> individuals have opinions that are reasoned and truths that are absolute (right/wrong and universal); CON-T and REC-T beliefs represent separate structures in this category hence beliefs are not integrated by an overarching,</td>
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</tr>
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*APJTED 4(1), June 2001*
differentiated structure

Receive absolute truths

**REC**

**How:** individuals receive absolute (right/wrong and universal) truths from an external source; this means that individuals passively receive truths that are a direct representation of reality. Experts facilitate the reception of absolute truths

**What:** individuals have truths that are absolute (right/wrong, universal) truths; the REC-T beliefs in this category represent a single organizing structure that is undifferentiated

When I talk about truth I guess ... things that are pretty much laid out as in I believe in absolute not relativistic truths...

The best way I can give it is as an analogy - if you have a white board and you look at the white board it is white but if somebody else looks at the white board through rose coloured glasses they think it is rose where in fact it hasn't changed the fact that the white board is still while. (48)

Note. The numbers in brackets that follow quotes refer to student identification numbers.

Next, students who are described as being INCONSISTENT also have mixed beliefs about knowing, which involve both the construction of reasoned truths and the reception of absolute truths. These students’ responses evidenced some inconsistency in their core beliefs about knowing because they clearly described different categories of core beliefs throughout their interviews. Typically, students described both CON and CONREC beliefs in separate sections of their interview responses. However, all students with INCONSISTENT beliefs had a stronger focus on CON core beliefs than those students who were categorized as holding CONREC beliefs.

Finally, students with CON beliefs were aware that truths are predominantly constructed and reasoned and in this analysis are considered to hold the most sophisticated set of epistemological beliefs. There is ongoing debate, however, concerning the validity of such beliefs about knowing as developmental ideals (Goldberger, 1996a). Goldberger (1996b) recognised that, in certain cultures, relativistic ways of knowing may not be appropriate. However, she defended the superiority of such “developmental endpoints” (Goldberger, 1996a, p. 13) within the American context (Goldberger, 1996b) by describing relativism as flexible thinking that is cognizant of multiple perspectives of knowing (Goldberger, 1996a). It could be argued that there is a need to be aware of, and reflect upon, multiple perspectives in Australian society also. Therefore, in this analysis, CON beliefs may be a considered a developmental ideal for the student teachers whose future work will take place in an increasingly pluralistic cultural, social and educational context.
Beliefs about Learning

The second major category to emerge was beliefs about learning, which comprised beliefs about learning strategies, conceptions and outcomes. These categories are described and exemplified in Table 3. Such beliefs about learning refer to an individual’s beliefs about their own learning in an academic context.

A developmental constructivist perspective is also taken to investigate beliefs about learning. This means that beliefs about learning are considered to be influenced by both an individual’s construction of knowledge and the social and cultural contexts in which individuals are situated. Therefore, to avoid the philosophical debate related to the extreme views of constructivism the term transformative is used in the current study and refers to those common characteristics of constructivism described by Tynjälä (1997). The use of the term transformative is more informative than the use of qualitative as a term because it more clearly indicates a process of construction or transformation. Reproductive is the term used in this study to describe the more quantitative beliefs. The term reproductive does not simply mean the reproduction of information for assessment as implied in Marton et al.’s. (1993) conception (b). It is intended to refer to all beliefs about learning that reflect the view that information is reproduced as an internal representation of an external reality. The terms transformative and reproductive have also been used by Entwistle (1998) to describe qualitative and quantitative perspectives of learning respectively.

Within each of the categories for learning, there emerged clear distinctions in subcategories between transformative and reproductive perspectives of learning. Transformative learning beliefs reflected the perspective that learning is a process of active, personal construction of meaning. Such beliefs are transformative in nature because understanding emerges from a transformation of the information in relation to the learners’ prior knowledge rather than a focus on aggregating quantities of information that remained unconnected to prior knowledge. Reproductive learning beliefs reflected an orientation that learning is a process of reproducing rather than transforming knowledge. Therefore, there was no transformation of the information and limited or no connection to the learner’s prior knowledge. The learner with a reproductive
perspective aimed to acquire and transfer quantities of information without any transformation of the information to develop personal meaning.

Table 3

<table>
<thead>
<tr>
<th>Categories</th>
<th>Description</th>
<th>Example statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning strategies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transformative</td>
<td>Strategies that transform information in order to derive personal meaning;</td>
<td>I guess I look at it more, I integrate other aspects of life or other knowledge that I have rather than just being this new sort of isolated piece of knowledge. That for me is the deeper level when I integrate it into some sort of whole in terms of my life and my other knowledge I have. (33)</td>
</tr>
<tr>
<td>Learning strategies</td>
<td>these strategies are espoused with a clear preference for transformative learning strategies overall, although they may indicate that in certain contexts reproductive strategies are appropriate.</td>
<td></td>
</tr>
<tr>
<td>Reproductive</td>
<td>Strategies that reproduce information in order to avoid failure; no or few connections are made with prior knowledge; strategies are often focused on memorising or reproducing facts or studying without reflection; facilitates reproductive learning.</td>
<td>What I have done in the past — particularly if there is something I don’t understand, I just relate it to something I will remember when the times comes to recall it. You can do patterns, like taking the first letter of the word. (36)</td>
</tr>
<tr>
<td>learning strategies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conceptions of learning</td>
<td>Learning is transformative in nature; learning changes you as a person; an existential conception of learning</td>
<td>… the way I am learning now has changed me as a person not only because its a whole new way of learning but I think what I am learning has changed me as a person. (30)</td>
</tr>
<tr>
<td>A process of making meaning</td>
<td>Learning is transformative in nature; learning is a process of active knowledge construction by the individual to extract meaning from the learning task; learning changes your views or perspectives on things; learning is being open to other ideas</td>
<td>Learning is when you have basically changed your world view ... and also it helps if you relate it to things and that helps you gain understanding (48) Learning to me is a personal process of making meaning. And I don’t think that has really changed, everybody has their own preferred way of learning (62)</td>
</tr>
<tr>
<td>Changing behaviour</td>
<td>Learning is a change in an individuals’ behaviour; not clearly transformative in nature</td>
<td>Learning is probably about changing thoughts and behaviours. Once again it happens without us being aware of it, it is something that is happening all the time.(50)</td>
</tr>
<tr>
<td>Acquisition</td>
<td>Learning is reproductive in nature; learning is acquiring information without making the information meaningful to the individual</td>
<td>Learning is a process you go through when you come to know something new. Maybe just reinforcing something you already knew. Just expanding your mind, or your skills whatever it might be that your learning about. (36)</td>
</tr>
<tr>
<td>Learning outcomes</td>
<td>Changed views Individuals know they have learnt something when their views change and become a part of the person’s knowledge; clearly transformative in nature</td>
<td>When it’s your own, when it’s knowledge ... — it’s become a part of you — that’s when you have learnt — for real things for like important learning. (45)</td>
</tr>
<tr>
<td>Being open to further learning</td>
<td>Individuals recognise that learning will never be complete; reflects a view that truth is constructed and hence not absolute and completely “knowable”; clearly transformative in nature</td>
<td>I understand that I will never ever learn everything about anything ... I can never say that I have learnt everything that there is to know, I know that (55)</td>
</tr>
<tr>
<td>Being able to understand</td>
<td>Clearly transformative in nature; individuals know they have learnt something when they can make meaning of the information and apply the new knowledge to other contexts; they have learnt something when they can make connections to other ideas, concepts, theories; they have learnt something when they can come to an understanding of the truth or question such truths</td>
<td>I know I have learnt something when I can make connections with my other knowledge, when I can see how it fits into the bigger picture and when I can actually apply it in a different context (52)</td>
</tr>
<tr>
<td>Being able to explain</td>
<td>Individuals know they have learnt something when they are able to explain what they had learnt to others; not always clearly transformative in nature</td>
<td>I think that if you do fully understand something you probably begin to question it. So if you understand something you think well what if this happened and it wouldn't be true so I think when you do understand something you wouldn't just take it as the truth. (40)</td>
</tr>
<tr>
<td>Changed behavior</td>
<td>Individuals know they have learnt something when their behavior changes in some way; not clearly transformative in nature</td>
<td>I suppose usually either when I feel confident enough to discuss it with other people or to explain it to someone, to teach it to someone else. (52)</td>
</tr>
<tr>
<td>Being able to recall and apply</td>
<td>Individuals know they have learnt something when they are able to remember, recall, retell information and then use that information in some context; reproductive in nature</td>
<td>It is only really by testing yourself on it in some way or by using your knowledge in some way that you know it ... (48)</td>
</tr>
</tbody>
</table>
In the analyses of conceptions of learning and learning outcomes, individuals were categorized according to the most sophisticated belief espoused. Marton et al. (1993) also used a similar approach to categorizing individuals’ conceptions of learning. Marton et al. described six qualitatively different conceptions of learning that formed a hierarchy from reproductive through to more transformative conceptions of learning. In this analysis, similar hierarchies of beliefs were noted in the students' responses. Sophistication of beliefs about learning was determined by examining whether a subcategory of responses was indicative of a transformative or reproductive perspective on learning.

**Learning Strategies**

Students commented on the use of a range of learning strategies, which were mostly transformative in nature. See Table 2 for a further description of transformative strategies. Learning strategies are behaviours engaged in to bring about learning (Marton & Säljö, 1976) and often parallel a context-specific motive (Biggs, 1985). The combination of motive and strategy constitutes an approach to learning (Biggs, 1985). Only a few students described the use of learning strategies other than transformative learning strategies, namely reproductive strategies aimed at reproducing information to avoid failure.

**Conceptions of Learning**

Individual students often described a range of beliefs in response to the question “What is learning?” These included one or more of the following subcategories: namely, learning as “changing as a person,” “a process of making meaning,” “changing behavior,” and “acquisition.” Students who described learning as “changing as a person,” “a process of making meaning” essentially described learning as transformative in nature. This means that when students espoused such conceptions of learning they were clearly indicating a view that learning needed to involve a process of making personal meaning. When students commented on learning as “changing behavior” and “acquisition” they were considered to be describing a more reproductive perspective of learning because they were not clearly articulating learning as a process of making personal meaning.
Learning Outcomes

Students were asked to describe how they knew they had learnt something. A transformative view of learning was evident in responses categorized as “changed views,” “being open to further learning,” and “being able to understand.” The subcategories of “being able to explain,” “changed behavior,” and “being able to recall and apply” (or both) were not always clearly indicative of a transformative view of learning and often appeared to be more reproductive in nature. Sometimes this was simply because students did not always elaborate on such beliefs. It was possible that, when students described learning outcomes as “being able to explain,” they were referring to a transformative perspective of learning. However, because of a general lack of clarity, these descriptions of learning outcomes were mostly considered to be reproductive in nature.

Relationship between Core Beliefs about Knowing and Beliefs about Learning

With regard to core beliefs about knowing there were 18 students with CON beliefs, three with CONREC beliefs, and one with REC beliefs. Only seven students described multiple categories of beliefs and throughout their interviews were subsequently categorized as having INCONSISTENT core beliefs about knowing. It is acknowledged that students could hold multiple beliefs about knowing but it was the perceived focus of these beliefs that was used to assign individuals to a particular category of beliefs. For example, students with CONREC beliefs predominantly described the construction of truths but also described some beliefs in the reception of absolute truths.

Students held multiple beliefs about learning and were also allocated to a category of beliefs according to the focus of these beliefs. When considering students’ overall beliefs about learning, they were described as transformative or reproductive if students responded consistently in that manner in all their responses regarding learning strategies, conceptions and outcomes. If students had a combination of transformative and reproductive responses they were described as having mixed beliefs about learning. It could be expected that individuals with CON beliefs about knowing that reflect the construction of reasoned truths might conceive of learning as a process of construction of knowledge or hold a transformative view. Similarly, those with REC beliefs
that individuals receive absolute truths, might be expected to conceive of learning from a reproductive perspective where individuals receive information rather than construct personal meaning. These assumptions emerged from the notion that core beliefs about knowing filter other beliefs and knowledge (cf. Posner et al., 1982, and Sutton et al., 1996).

The relationship noted between students’ core beliefs about knowing and overall beliefs about learning is presented in Table 4.

<table>
<thead>
<tr>
<th>Overall beliefs about learning</th>
<th>Core beliefs about knowing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer beliefs</td>
<td>CON</td>
</tr>
<tr>
<td>Mixed beliefs</td>
<td>14</td>
</tr>
<tr>
<td>Mixed beliefs</td>
<td>4</td>
</tr>
</tbody>
</table>

Note: Dashes indicate that data were not obtained for that subcategory. Numbers in the table refer to the frequency of individuals reporting the various beliefs.

*This is an abbreviation for INCONSISTENT beliefs.

In Table 4, it can be seen that the three students who held CONREC beliefs and mixed overall beliefs about learning indicated some relationship between their core and peripheral beliefs. That is, it might be expected that students with CONREC beliefs that include mixed beliefs with respect to both the construction of reasoned truths and the reception of absolute truths might espouse mixed beliefs about the nature of learning. Twenty students also evidenced a relationship between core beliefs about knowing and beliefs about learning because they described CON or INCONSISTENT beliefs and overall transformative beliefs about learning. It was likely that students with CON or INCONSISTENT beliefs, who espoused stronger beliefs in the construction of reasoned truths than students with CONREC beliefs, would describe overall transformative beliefs about learning that involved personal meaning making.

There are six students for whom there does not appear to be a relationship between their core beliefs about knowing and their overall beliefs about learning. Four of these students held CON core beliefs and mixed overall beliefs about learning. It is possible that some of these students may have been unable to clearly articulate their beliefs in the interviews. For example, one student, while explaining a potentially sophisticated conception and outcome of
learning as a change in behavior, could not elaborate on this and so was coded as having a reproductive perspective. There were two other students (with REC and INCONSISTENT beliefs) who espoused mixed beliefs about learning. Although there are some inconsistencies between core and peripheral beliefs for a small number of students, there seems to be a strong relationship between beliefs about knowing and overall beliefs about learning for many students \((n=23)\).

**DISCUSSION**

A range of findings have emerged in this study in terms of core beliefs about knowing and the relationship between these beliefs and beliefs about learning. Each of these will be discussed in turn, followed by a discussion of teaching implications.

**Core Beliefs about Knowing**

The results of this study indicate that, as a group, students held a range of epistemological beliefs similar to those noted by Perry (1970), Baxter Magolda (1993) and Belenky et al. (1986). See Table 4. Students’ core beliefs about knowing reflected a range of beliefs from REC through to CON beliefs. Mostly students held multiple beliefs but it was the perceived focus of these beliefs that caused individuals to be assigned to a particular category. Students with CONREC beliefs had some beliefs in construction of reasoned truths but had a stronger focus on the importance of absolute truths in their responses than those described as INCONSISTENT. This suggests that multiple beliefs may be available to individuals but that some beliefs are more focused upon than others.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>REC beliefs</td>
<td>1. Basic duality (all authorities have</td>
<td>Silenced (lacks reflection)</td>
</tr>
</tbody>
</table>

| 20 |

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| 2. Multiplicity prelegitimate (some authorities are right, others wrong) |
| 3. Multiplicity subordinate (opinions appropriate until truth discovered) |
| 4a. Multiplicity co-ordinate (personal beliefs personal are valued) |
| Received knowing (right/wrong) |

CONREC beliefs

**INCONSISTENT beliefs**

4b. Relativism subordinate (value opinions supported by evidence in some contexts only)

**CON beliefs**

5. Relativism Diffuse (relativism is a feature of all learning) Procedural knowing (reasoned reflection)
6. Commitment foreseen (recognizes need for commitment in one’s beliefs) Constructed knowing (integration of procedural and subjective)

7-9. Evolving commitments (multiple commitments leading finally to commitments that are open to change)

Schommer (1994) also noticed that epistemological beliefs were multidimensional and, furthermore, could be described more effectively as frequency distributions. For example, students with sophisticated beliefs about the nature of truth may believe that truth is relativistic but hold some beliefs in the absolute nature of truth. It is also probable that individuals who espouse naïve beliefs about the nature of truth may believe that truth is absolute whilst minimally they may hold some beliefs that truths are relativistic (Schommer, 1994). This notion of frequency distributions suggests that some beliefs may be a dominant or focal in an individual’s core beliefs.

**Relationship between Core Beliefs about Knowing and Beliefs about Learning**

Research related to tertiary students’ beliefs about and approaches to learning is not new. Beginning with Marton’s seminal work in the 1970s, student learning research has contributed a great deal to our understanding of how students’ beliefs about learning influence their approaches to learning. However, this study extends those understandings by considering another set of beliefs related to learning that have often been overlooked. This study has investigated how core beliefs about knowing are related to peripheral beliefs about learning.

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In this study, most students \((n=28)\) held at least some CON beliefs about knowing (which here includes CON, INCONSISTENT and CONREC beliefs) and also variously described transformative learning strategies, conceptions of learning and learning outcomes. In fact, it could be expected that individuals who have CON beliefs about knowing reflecting the construction of reasoned truths might conceive of learning as a process of construction of knowledge or hold a transformative view. Similarly, those who have REC beliefs that individuals receive absolute truths, might be expected to conceive of learning from a reproductive perspective where individuals receive information rather than construct personal meaning.

This offers some evidence of a relationship between core and peripheral beliefs, although it is not clear whether such consistency would be evident in a group of students with a broader range of core beliefs about knowing or if asked to reflect on a particular learning context.

There is ongoing debate within epistemological beliefs research regarding the context specific nature or otherwise of core beliefs about knowing (cf. Scheurman, 1995). Whilst some researchers would argue that core beliefs about knowing can not be considered to be separate from a particular domain of knowledge (cf. Debold, Tolman, & Brown, 1996; Mori, 1997), there are also others who believe that such beliefs are generalisable across a number of domains (see Perry, 1981; Scheurman, 1995; Schommer & Walker, 1995). Ruddick (1996) believed that individuals may have different core beliefs about knowing in different contexts with a dominant way of knowing occurring across such contexts. If beliefs about knowing are considered to be central within a system and thus filter knowledge and other beliefs, then it is likely that they will be evident across a range of learning contexts. Further research may usefully investigate the viability of using teaching interventions that are focussed on encouraging students to reflect on their epistemological beliefs. Teacher education programs that help students to focus explicitly on epistemological beliefs may facilitate the development of epistemological beliefs that will ultimately influence their perspectives of learning and teaching.

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