An investigation of teacher education students' epistemological beliefs: Developing a relational model of teaching

Dr Joanne Brownlee
Centre for Innovation in Education
Queensland University of Technology
Victoria Park Road
Kelvin Grove Q 4059

Abstract
A teaching program based on relational pedagogy (Baxter Magolda, 1993a) was implemented to foster the development of epistemological beliefs in 29 pre-service teacher education students at a large metropolitan university in Australia. Epistemological beliefs are those personally held beliefs about the nature and structure of knowing. The students were interviewed in relation to their epistemological beliefs at the beginning (Time 1) and conclusion (Time 2) of the teaching program. The results of the qualitative data analysis indicated that students described more sophisticated relational epistemological beliefs over time. This finding is important given that teachers with relativistic epistemological beliefs are more likely to conceive of teaching as a transformative (constructivist) rather than transmissive. The perceived success of the teaching program has implications for the development of a relational teaching model in teacher education courses.

Key Words: epistemological beliefs; pre-service teacher education; constructivism; graduate students; beliefs about teaching

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Background

Teachers, like all knowledge workers, need to be self-regulated, critically reflective life-long learners. Therefore it is important to attend to the “how” (processes) of learning as well as the “what” (content) (Klatter, Lodewijks, & Aarnoutse, 2001). With this in mind, a growing body of research is indicating that teacher educators need to focus on teacher beliefs as a way to facilitate effective learning in tertiary education (Fang, 1996; Richardson, Anders, Tidwell & Lloyd, 1991). In particular, the body of literature related to teacher beliefs about knowing and learning, otherwise known as epistemological beliefs, may provide valuable insights into how to improve teaching and learning in higher education (Beers, 1984; Hofer, 1994; Hofer & Pintrich, 1997; Schommer, 1990, 1993a, 1993b). In the context of this study, epistemological beliefs refer holistically to personally held beliefs about what knowledge is, how it can be gained, its degree of certainty, and the limits and criteria for determining knowledge (Perry, 1981).

The seminal work of William Perry (1970) revealed that liberal arts students at Harvard and Radcliffe universities increasingly developed more complex and integrated epistemological beliefs as they progressed through their course. Perry (1970) noticed that students moved through four main epistemological positions, which he described as dualism, multiplism, relativism and commitment. Individuals who held dualistic views about the nature of knowledge believed that absolute truths (right/wrong) exist and could be transmitted to an individual from an authority or expert. Next, when individuals began to conceive of knowledge in a multiplistic way, they conceded that as well as absolute truths, there were some things that could not be known with any certainty. Such individuals believed that knowledge comprised both personal opinions and ultimate truths. They relied less on authorities for absolute truths, and personal opinions and truths were still considered to be “right” or “wrong”. The next position, relativism, constituted a major shift in epistemological thinking because individuals considered that knowledge was actively and personally constructed, although initially this may have occurred in some contexts only. Absolute truths could no longer exist because truth was considered to be relative to individuals’ personal interpretations of experiences. In the final positions related to commitment, relativistic thinking was still a feature, but particular beliefs were more valued than others and were committed to in a flexible manner. Although these positions were not intended to be gender specific, they were derived using male Harvard students. In subsequent research, Belenky et al. (1986) derived a similar set of epistemological positions using a female sample.

Baxter Magolda (1993a) continued this line of research using a sample of more than 100 male and female college students in longitudinal research. The students were interviewed yearly using open-ended questions and asked to complete short answer responses to the Measure of Epistemological Reflections (MER). The sample included 50 males and 51 females at a Midwestern University with a final sample of 80 students in the fourth year of the study (Baxter Magolda, 1994). This study was extended also into the post-college years with 70 students (Baxter Magolda, 1994).

Baxter Magolda (1988) demonstrated different ways of knowing for both genders within each of the positions. Relational modes of knowing, which are open, flexible, connected and responsive, are considered more typical of women's ways of knowing. Such ways of knowing are influenced by a set of beliefs ‘that values the relationships of the reasoners over any particular outcome and... is marked by attachment and connection rather than separation and abstraction’ (Noddings, 1991, p. 158). Conversely, the impersonal or objective mode of knowing is often characterised
by the use of logical, algorithmic procedures that result in separateness and abstraction (Baxter Magolda, 1993a). The positions are described as absolute, transitional, independent and contextual (Baxter Magolda, 1993a). Each of these positions will be discussed in turn.

**Absolute knowing.** In this position, knowledge is likely to be viewed as certain, which is similar to Perry’s dualism (1970, 1981). The relational way of knowing in this position is described as the receiving pattern. In this pattern students prefer a supportive environment for listening and recording information. The objective mode is described as a mastery pattern and is often associated with more active interaction such as asking questions within a classroom environment.

**Transitional knowing.** In this position, individuals are likely to believe in uncertainty in some areas of knowledge (Baxter Magolda, 1994). Opinions count in some areas because truths are still to be discovered and personal beliefs are valued. Perry (1981) described this as multiplicity. In transitional knowing, students who prefer relational ways of thinking (interpersonal pattern) are likely to learn by including their own and other’s opinions. Students with objective modes of knowing (impersonal pattern) often use individual thinking processes, for example, focussing on recall to develop a personal opinion or viewpoint. This position is often evident in individuals in the middle years of tertiary education (Baxter Magolda, 1994).

**Independent knowing.** This way of knowing may develop in the later years of tertiary study with individuals likely to perceive that most knowledge is uncertain and tentative: “Learners with this perspective begin to think for themselves and make judgments based on their own perspectives or biases” (Baxter Magolda, 1994, p. 26). Baxter Magolda (1992) described independent knowers as being focussed on active learning and critical thinking. “Encounters with contradictory views were foundational to independent knowers. Every theme in every category hinged on the existence of different perspectives and the acceptance of contradictory views” (Baxter Magolda, 1992, p. 281). Students using relational modes (interindividual pattern) are more likely to focus on other students' viewpoints whereas students with objective modes of thinking (individual pattern) mostly focus on their own perspectives as representing reasoned reflection (Baxter Magolda, 1993a). This position is similar to Perry's (1981) description of relativism.

**Contextual knowing.** In this final position, both the relational (self) and objective (procedures) modes of knowing are combined (Baxter Magolda, 1993a). This way of knowing is not common in undergraduate studies but becomes increasingly more common, along with independent knowing, in individuals who have engaged in postgraduate studies (Baxter Magolda, 1994). Contextual knowers consider all aspects of issues including expert (objective knowing) and personal knowledge (relational knowing) (Baxter Magolda, 1996a). This set of beliefs may be similar to Perry’s relativism with commitment where relativistic thinking is prominent, but particular personal beliefs are more valued than others on the basis of evidence and are committed to in a flexible manner. Individuals who engage in contextual knowing are also more likely to prefer to learn in an environment where they can discuss different perspectives in context (Baxter Magolda, 1993b). Therefore, intellect and one's own perspective (self) are combined in the process of coming to know (Baxter Magolda, 1993a). This supports the case for drawing on students’ beliefs (emotional knowing) in the context of tertiary education to develop more mature ways of knowing: "Emotion always plays a part in the construction of knowledge" (Baxter Magolda, 1993a, p. 29).

There have been many debates surrounding the research on developmental epistemological beliefs. One such debate questions the viability of a unidimensional set of beliefs that changes over time. Using a somewhat different focus on epistemological beliefs, Schommer conceived of epistemological perspectives as multidimensional. Her research suggests that individuals may hold a range of sophisticated (more relativistic) and naïve (more dualistic) beliefs. 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). Schommer (1994) believed that individuals may hold a range of epistemological beliefs but that some will be more focal than others. For example, an individual who is considered to have sophisticated epistemological beliefs may still hold some beliefs that a very small amount of knowledge is unchanging and black and white. Conversely individuals who are considered to have naïve beliefs may believe that a small amount of knowledge is evolving and needing to be critically evaluated. This would suggest that epistemological beliefs may not develop evenly and that a range of beliefs may influence learning.

Teaching, as well as learning, may also be influenced by epistemological beliefs. Brownlee (2003, 2001b) and Entwistle, Skinner, Entwistle and Orr (2000) described links between epistemological beliefs, and beliefs about teaching and learning. This means that individuals with relativistic epistemological beliefs are more likely to conceive of teaching as a process of facilitation rather than one based only transmission of knowledge. Specifically, it might be expected that individuals who have more sophisticated epistemological beliefs, that is that individuals construct truths, would also conceive of teaching in a similar manner. This means that they may be likely to conceive of teaching from a constructivist or transformative perspective. From this perspective teaching and learning becomes a two-way interaction, which implies a relational approach to teaching. Students and the teacher become co-learners. Conversely, individuals who have more dualistic beliefs that focus on truth as absolute and categorical might be expected to conceive of teaching from a more reproductive perspective. When a teacher has reproductive teaching as a focus little attention may be paid to how learners make personal meaning and make connections to their prior knowledge. Such teaching encourages learners to receive and acquire information. It is the focus on reproduction to the exclusion of transformative approaches that may be counterproductive to meaningful learning experiences. Such a view of teaching implies a one-way interaction, which is not relational in nature. Students and teachers are not co-learners in this approach to teaching.

Belenky et al. (1986) argued that connected teaching in tertiary education is required to help students develop epistemological beliefs. When students experience connected teaching they are supported in using both relational (own experiences) and impersonal (experts) ways of knowing (Baxter Magolda, 1993a). This interrelationship between self and theory is characteristic of the more sophisticated ways of knowing as described in the schemes of Baxter Magolda (1993a), Belenky et al., (1986) and Perry (1970).

Baxter Magolda (1996b) described a version of connected teaching, which she called relational pedagogy. This approach to teaching also helps students to develop more sophisticated ways of knowing by (a) respecting the student as a knower (Baxter Magolda, 1992; King & Kitchener, 1994); (b) providing learning experiences that relate to students' experiences; (c) facilitating a constructivist perspective of knowing and learning, and providing opportunities for learners to access peer perspectives (Baxter Magolda, 1993b, 1996a, 1996b).

Relational pedagogy and connected teaching both imply that tertiary teaching should be a relational activity: that is, connections between self and theory (epistemological beliefs) and interpersonal relationships. Therefore, to help student develop more sophisticated (and relational) epistemological beliefs that connect self and theory, it is important to consider how teacher education programs may be improved using pedagogy, which is also, relational in nature.
Method

The aim of this study was to investigate graduate pre-service teachers’ epistemological beliefs during a teaching program based on relational pedagogy and designed to encourage the development of more sophisticated, relational epistemological beliefs.

The Participants

Twenty-nine Graduate Diploma in Education students studying in a year long educational psychology unit were part of a teaching program in a large metropolitan university in Australia. The Graduate Diploma was completed in one year. Purposive sampling (cf. Lincoln & Guba, 1985) was used. This means that students were specifically chosen because they were engaged in the educational psychology unit for the whole year as opposed to one semester as often happens in many undergraduate courses. The longer time frame allowed more opportunities for students to change their epistemological beliefs. Involvement in the teaching program was voluntary.

The students variously held degrees in Business, Social Science, Leisure Management, Psychology, Visual and Performing Arts, Science, Literature, and Nursing. The group comprised 3 males and 26 females with a mean age of 27.65 years. As a group, students reported a considerable range of prior teaching experiences. These included secondary school teaching, training experience in the workplace, tutoring experience, parenting experiences, helpers at camps and church functions, classroom volunteers, working in after school care and working as a teacher aide.

Students’ Learning Environment

The students were asked to reflect on the unit content in relation to the epistemological beliefs literature and their own epistemological beliefs. For example, when discussing the topic of cognitive development, students also reflected on the development of intellectual functioning from an epistemological perspective (e.g., Perry’s work). A relational organisation for the course content (cf. Biggs & Collis, 1982) was therefore provided by encouraging students to link tutorial content to an epistemological beliefs framework. In addition to relational curriculum, relational pedagogy was also used in the teaching program (Baxter Magolda, 1996b). It is acknowledged that the author brought a particular set of epistemological beliefs to this teaching program. Goldberger (1996b) commented 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) in the western context by describing relativism as flexible thinking that is cognizant of multiple perspectives of knowing (Goldberger, 1996a). The current study is influenced by the author’s beliefs that relativism and transformative teaching practices are developmental ideals for Australian teachers in a pluralistic cultural and educational contexts.

The use of relational pedagogy encourages students to include personal beliefs/experiences and evidence/theory to support and validate such beliefs, in an atmosphere of care and trust. Therefore, students are encouraged to become, what Baxter Magolda (1996a) calls, contextual knowers. The three elements of relational pedagogy regarding mutual respect, situating learning in students’ experiences, and facilitating a constructivist perspective of knowing and learning, were addressed in the following manner.

*Mutual respect* was fostered through a focus on being supportive both cognitively and emotionally: being empathetic and respectful of students’ experiences. Such respect also was nurtured by *situating learning in students’ experiences*. This was achieved by engaging students in journal writing process, whereby students were encouraged to use their own experiences to
link with the theoretical issues. *Helping students to construct knowledge* was also facilitated by encouraging students to include personal beliefs/experiences and evidence/theory to support and validate such beliefs, in their journal entries. This linking of beliefs and theory was a useful exercise for students engaged in an Educational Psychology unit. However, such linking of personal beliefs to theory may not be successful for students engaged in science based disciplines where constructing knowledge may rely less on personal opinions and more on weighing up evidence from multiple sources. Essentially, the journal assessment helped students to reflect explicitly on their epistemological beliefs. Biggs (1996b) described a constructivist alignment of assessment with beliefs about teaching and learning and course objectives. The journal assessment was aligned with constructivist teaching objectives and approaches. It enabled the use of qualitative assessment which facilitated the investigation of changes in students’ understanding over time and the application of theory to real situations (cf. Biggs, 1996a).

All students wrote regular journal reflections as a way of reflecting explicitly on their epistemological beliefs. They completed at least eight required journal entries throughout the year related to specific topics discussed in the educational psychology unit. Their first journal entry was a structured reflection on their Time 1 interview. They were free to complete as many reflections as they wished, but they were assessed on only eight journal entries. However, the students were encouraged to submit each individual journal entry as it was written so that they could receive feedback. Students were reminded throughout the teaching program that they were not being assessed on the nature of their beliefs. As well as the usual criteria associated with appropriate writing style, students were assessed on the degree to which they reflected on their personal beliefs about learning and knowledge, their demonstrated understanding of key concepts, the sophistication of their reflections (descriptive, dialogic, critical) and their ability to link theory to personal beliefs and experiences. In this way it was hoped that students would not perceive the need to reflect on particular sophisticated epistemological beliefs described in their readings to achieve higher grades. Information that offered guidelines for writing journals was distributed and considerable discussion took place in tutorials regarding the process of reflection.

**Gathering and Analysing Data**

At Time 1 (the beginning of the year-long unit) and Time 2 (the conclusion of the year-long unit), students were interviewed regarding their epistemological beliefs. These interviews took between 35 and 60 minutes, with the average being approximately 40 minutes in duration. They were conducted on the university campus and audio taped for later transcription. Time 1 interviews were conducted in the first two weeks of semester before any discussions about learning and teaching took place in the tutorial sessions. Individual students transcribed their own audio tapes verbatim. The Time 2 interviews were audio taped and transcribed verbatim by the interviewer.

The interviews were semi-structured with questions that enabled information to be gained about specific beliefs and also allowed students to discuss topics openly within such parameters. The questions related to epistemological beliefs were similar to those used by Belenky et al. (1986) in their study of women’s ways of knowing. In particular, students were asked to describe their beliefs about the nature of truth and how it was obtained. See Appendix 1 for more details.

Analysis of the interviews 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, 1996). The categories that emerged were audited by a second person 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 organisation of data emerging from the transcriptions of the audiotapes.

In the context of this study, epistemological beliefs refer to an individual’s dominant or default beliefs. Students were asked to comment on their beliefs in a global manner, rather than in a specific context. Therefore, it was expected that responses that were not focussed on a specific domain of knowledge would be indicative of their default or general epistemological beliefs.

**Discussion of Findings**

There are two sections used to discuss the findings. The first section is a description of the categories and subcategories of epistemological beliefs that emerged in the analysis of interviews. The second section is a discussion of changes in epistemological beliefs over time.

**Epistemological beliefs**

According to Marton and Booth (1997), to be able to experience something an individual has to be able to assign the experience some meaning (referential aspects) and also see it in relation to its background (structural aspects). Structure implies meaning and meaning implies structure: The two are intertwined and occur simultaneously. Therefore, epistemological beliefs as outcomes of experience, may be described as having referential and structural characteristics (cf. Marton & Booth, 1997). Referential characteristics of the categories of epistemological beliefs will be described first, followed by an overview of the structural dimensions. Descriptions and exemplars for the subcategories of epistemological beliefs are presented in Table 1.

**Referential characteristics of epistemological beliefs.** Although it is recognised that sophisticated epistemological beliefs do not necessarily constitute a developmental ideal in all cultures, this current study is based on an assumption that such relativistic beliefs are important in the Australian primary education context. The pluralistic nature of Australian culture, and therefore the school culture, means that primary school teachers need to be flexible, tolerant of multiple realities and reliant on a professional rather than intuitive knowledge base.

In Table 1, the categories related to epistemological beliefs ranged from naïve beliefs in the reception of absolute truths to more sophisticated beliefs in the construction of reasoned truths. These categories of beliefs are quite similar to the positions described by Perry (1970) and Baxter Magolda (1993a) as indicated in Table 2.

In the category of REC (Receive absolute truths) beliefs, truths were considered to be absolute and transferable to individuals. Perry described this as dualism (1970) while Baxter Magolda (1993a) described it as absolute knowing. The category of SUBREC (Construct subjective truths and receive absolute truths) beliefs represents a more sophisticated set of beliefs because individuals with these beliefs acknowledge that some truth is constructed. However, there is no recognition of having to support or validate these opinions with evidence. This is similar to multiplism (Perry, 1970) and transitional knowing (Baxter Magolda, 1993a).

In the next category of CONREC (Construct reasoned truths and receive absolute truths) beliefs, students held some beliefs in the construction of reasoned truths and some beliefs in the reception of absolute truths. The beliefs related to the construction of reasoned truths, or relativism (Perry, 1970), featured minimally and only occurred in certain contexts. These beliefs did not embrace relativism as an overarching, organising structure. Therefore, varying
beliefs coexisted when students held CONREC beliefs. These beliefs are similar to Perry’s relativism subordinate.

The final set of beliefs was described as CON (Construct reasoned truths) beliefs. CON beliefs are similar to contextual knowing as described by Baxter Magolda (1993a) and relativism (Perry, 1970). In this category, students believed that they could not know truth with certainty because such truth was a matter of individual interpretation. However, interpretations must be validated to provide the most reasonable construction of reality. These beliefs constituted an accommodation of the old dualistic structure to one that acknowledged that most knowledge is tentative and open to interpretation (cf. Perry, 1970).

Structural characteristics of epistemological beliefs. The findings also indicate that there is a structural dimension of epistemological beliefs (see also Brownlee, 2001a). The Structure of Observed Learning Outcomes (SOLO) taxonomy (Biggs & Collis, 1982) can be used as a guide to discuss categories in terms of the structural characteristics of beliefs. The SOLO taxonomy (Biggs & Collis, 1982) was developed to evaluate, qualitatively, learning outcomes in primary and secondary education in relation to how students structure or organise what they are learning. There are five levels of understanding or learning outcomes. These levels range from a lack of understanding or incompetence to a relational understanding of multiple aspects of the topic.

The first is the Prestructural level of understanding. Students who demonstrate prestructural knowledge do not understand the topic. The second level of understanding is called Unistructural, and individuals with such knowledge focus on one relevant part of the topic. The next level is called Multistructural and shows an understanding of many significant independent aspects of the topic. However, these aspects are not integrated into an overall structure and the individual does not understand how the various aspects of the topic interconnect. The Relational level shows an understanding of the differentiated aspects of the topic and they are also able to see interconnecting themes or “big ideas”. The fifth and final level of response is the Extended Abstract level. At this level, integrated knowledge is generalised more abstractly to a new domain.

REC beliefs can be described as having a Unistructural organisation because there is a single structure of beliefs, that is the reception of absolute truths. According to Biggs and Collis (1982), a Unistructural response indicates an understanding of, and focus on, one relevant aspect of the topic. In SUBREC beliefs there is an increased differentiation of beliefs because this subcategory reflects beliefs in both the reception of truths and construction of opinions that are not necessarily supported with evidence. This Multistructural level of response displays knowledge of at least two independent aspects of knowing (cf. Biggs & Collis, 1982). However, an overall structure does not integrate these aspects. This means there is no relationship evident between the various epistemological beliefs. CONREC beliefs also appear to have a Multistructural organisation because beliefs in the reception of absolute truths and construction of individual truths are evident in this category. Finally, CON beliefs have a Relational structural organisation. This means that all beliefs about truth are organised by the single structure of relativism. At a Relational level of organisation, the relevant aspects of learning are integrated into an overall structure (Biggs & Collis, 1982).

In this study, sophisticated epistemological beliefs were shown to be relational in both the referential and structural dimensions. This means that the referential aspects of such beliefs showed clear links between self and theory while the structural aspects showed a relational organisation of ideas.
<table>
<thead>
<tr>
<th>Categories</th>
<th>Descriptions: Referential and Structural Aspects</th>
<th>Example statements</th>
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</thead>
<tbody>
<tr>
<td><strong>Construct reasoned truths</strong> CON</td>
<td><strong>Referential:</strong> 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. There is a distinct link between self and theory. Also, individuals have opinions that are reasoned hence some opinions are better than others because they are informed by current research and experience. <strong>Structural.</strong> The beliefs in this category represent an overarching, differentiated structure that integrates an individual’s beliefs about the nature of truth.</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><strong>Construct reasoned truths and receive absolute truths</strong> CONREC</td>
<td><strong>Referential:</strong> Individuals construct personal truths that are supported with evidence and individuals receive absolute (right/wrong and universal) truths from an external source. Therefore, individuals actively create their own truths and passively receive truths that are a direct representation of reality. In this category, individuals have opinions that are reasoned and truths that are absolute (right/wrong and universal). <strong>Structural.</strong> Beliefs represent separate structures in this category hence beliefs are not integrated by an overarching structure.</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><strong>Construct subjective truths and receive absolute truths</strong> SUBREC</td>
<td><strong>Referential:</strong> Individuals construct personal truths but these truths are not 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, which are intuitive rather than informed and passively receive truths that are a direct representation of reality. Furthermore, they hold opinions that are not reasoned but are subjective in nature and truths that are absolute (right/wrong, universal). <strong>Structural.</strong> Beliefs in this category represent separate structures which are not integrated by an overarching structure.</td>
<td>I still think truth is made up of personal opinion so I strongly still believe that it is one’s opinion, truth is. And it can change to varying sort of different situations and things like that. So I think it is a personal sort of thing. . . [An opinion is] something you may not know much about but you have sort of a feeling inside. . . (43).</td>
</tr>
<tr>
<td><strong>Receive absolute truths</strong> REC</td>
<td><strong>Referential:</strong> Individuals receive absolute (right/wrong and universal) truths from an external source. Therefore, individuals passively receive truths that are a direct representation of reality. Such individuals have beliefs that truths that are absolute (right/wrong, universal) truths. <strong>Structural.</strong> The beliefs in this category represent a single organising structure that is undifferentiated.</td>
<td>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 white. (48)</td>
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Table 2
A comparison of the results of this study with positions in various epistemological development schemes

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>REC beliefs</td>
<td>Dualism (all authorities have answers)</td>
<td>Absolute knowing (knowledge certain)</td>
</tr>
<tr>
<td>SUBREC beliefs</td>
<td>Multiplicity (opinions appropriate until truth discovered)</td>
<td>Transitional knowing (uncertainty some areas of knowing)</td>
</tr>
<tr>
<td>CONREC beliefs</td>
<td>Relativism subordinate (value opinions supported by evidence in some contexts only)</td>
<td></td>
</tr>
<tr>
<td>CON beliefs</td>
<td>Relativism (relativism is a feature of all learning)</td>
<td>Independent knowing (all knowledge uncertain)</td>
</tr>
<tr>
<td></td>
<td>Relativism with commitment (combines personal beliefs with theory to support such beliefs)</td>
<td>Contextual knowing (combines impersonal &amp; relational modes of knowing)</td>
</tr>
</tbody>
</table>

A Comparison of Beliefs over Time

Students’ epistemological beliefs are now compared over the two time phases. The percentage of individuals with CON, CONREC, SUBREC and REC beliefs in both groups at Time 1 and Time 2 are presented in Table 3.

Table 3
Percentage of students describing epistemological beliefs at Time 1 and Time 2

<table>
<thead>
<tr>
<th>Times</th>
<th>CON</th>
<th>CONREC</th>
<th>SUBREC</th>
<th>REC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 1 (n=28)</td>
<td>14</td>
<td>63</td>
<td>18</td>
<td>4</td>
</tr>
<tr>
<td>Time 2 (n=29)</td>
<td>38</td>
<td>58</td>
<td>--</td>
<td>4</td>
</tr>
</tbody>
</table>

Note. Dashes indicate that data were not obtained for that subcategory. The number of individuals espousing various beliefs in each group is expressed as a percentage of the group’s sample size.

Over the year, more students described CON beliefs while fewer students described CONREC
and SUBREC beliefs. This change towards more sophisticated beliefs is also noted in quantitative data analysis reported elsewhere in Brownlee, Boulton-Lewis, and Purdie (2001). Brownlee et al. administered Schommer’s (1990) epistemological beliefs questionnaire to both a comparison group (students not engaged in the teaching program, but forming another tutorial group for whom the author had responsibility) and the students in the teaching program at Time 1 and Time 2. This questionnaire measured epistemological beliefs. The results indicated that the group of students engaged in the teaching program experienced more growth in sophisticated epistemological beliefs as compared with the comparison tutorial group. However, it is not possible to say that the teaching program itself was the only thing responsible for the changes. Other factors such as participation in the Graduate Diploma course in general or life experiences may have facilitated such changes. Students were asked to comment in their final interview about their views on why they believed changes had occurred. Nearly all the students (n=27) in the teaching program commented positively on how the explicit reflections on epistemological beliefs in the teaching program helped them become more reflective about their beliefs, for example

*It has changed because of the different – like this degree has been structured a lot differently. You know you have to start questioning what’s going on here... (This unit) played the biggest part because other subjects didn’t really require journal entries but through the journal entries and discussions in lectures and talking to people in general, it made me look at my beliefs, my epistemological beliefs. I never knew what they were all about at first. (Bob)*

*Just being able to think about yourself more, is the main thing that I learnt from the subject I think. With the journal entries you have to really pick your brain for what is in there, what you believe. (Sarah)*

**Teaching Implications**

It is possible that students have been encouraged, through the use of relational pedagogy, to develop more sophisticated epistemological beliefs. In this teaching program, students were helped to explicitly reflect on their epistemological beliefs through interviews and reflections in journal entries. This was done to assist students to reflect on and possibly reconstruct epistemological beliefs into more sophisticated epistemological beliefs. The following Figure is a summary of relational teaching that has emerged in this study and is based on the 3P Model of Learning (Biggs, 1993). In this model of teaching, the 3 “P’s” are based on the presage, process and product aspects of teaching rather than learning as originally described by Biggs’ model.

In Figure 1, teachers come to a teaching/learning context with their personal epistemological beliefs, abilities, and knowledge, which represent personal presage factors. Such personal factors interact with the teaching context (situational presage factors) to produce an approach to teaching. This suggests that teachers’ personal and situational presage factors will influence the use of relational pedagogy (and relational curriculum) as an approach to teaching and ultimately teaching outcomes which comprise the development of students’ epistemological beliefs. This means relational pedagogy, which values students as knowers, experiences that relate to student’s experience and constructivist approaches to teaching must also be supported by a relational curriculum that connects the content of course (structural aspects). This expected to lead to the development of relational, sophisticated epistemological beliefs, which includes the referential aspects of self and theory and structural aspects regarding the relational organisation of beliefs.
Relational epistemological beliefs may be characterised as such according to Baxter Magolda (1993a) because both expert and personal ways of knowing are interconnected. This is the referential component of beliefs. However, the current study has indicated that such sophisticated beliefs may be relational in terms of the structure of such beliefs also. The structure of knowing outcomes may have implications for teaching programs designed to develop epistemological beliefs. See Figure 1, Process component of the model that refers to relational pedagogy. It may be helpful for teacher educators to get students to think about the many ways of knowing (increased differentiation of beliefs) available to them and then encourage them to see how these beliefs are linked. That is, help students to find the big ideas that link or relate their ways of knowing. This may enable students to develop relational structures to connect their epistemological beliefs. Indirectly, the structural aspects of Relational thinking could also be encouraged through modelling. For example, in the current study, the unit content was integrated using an overarching structure of epistemological beliefs. This means that both the unit content and the assessment (journal entries) have relied on the literature related to epistemological beliefs as a structure to interconnect topics, therefore encouraging and modelling a relational structure. This is described in the process component of the Model as relational curriculum.

Figure 1. A Relational model of teaching (adapted from Biggs, 1993 3P Model of Learning)

The results of this study also suggest that teaching programs that focus explicitly on students’ epistemological beliefs and constructivist, connected teaching/learning environments may influence students’ epistemological beliefs. It is possible that the teaching program in the current study has been successful in developing relational, sophisticated epistemological beliefs because students have been encouraged to reflect on their epistemological beliefs. See Figure 1, Process component of the model that refers to relational pedagogy. This means that sophisticated epistemological beliefs may be facilitated directly through explicit reflections on both the referential and structural aspects of such beliefs. However, the development of epistemological beliefs may also be encouraged indirectly through a focus on the teaching-learning environment itself. In particular, this teaching program has attempted to influence epistemological beliefs of
the student teachers through the use of a teaching program based on relational pedagogy. This involved (a) respecting the student as a knower (Baxter Magolda, 1992; King & Kitchener, 1994), (b) providing learning experiences that related to students' experiences, and (c) facilitating a constructivist perspective of knowing and learning (Baxter Magolda, 1993b; 1996a; 1996b).

To summarise, relational pedagogy is considered to encourage the use of both relational and objectivist ways of knowing in a connected, relativistic view of epistemology (Baxter Magolda, 1993a). That is, it is focussed on the referential aspects of a relational approach to teaching. A model for future teaching programs as depicted in Figure 1 which extends Baxter Magolda’s relational pedagogy could incorporate a relational structural dimension that encourage students to think about the structural dimensions of their beliefs as well as the referential components. Both structural and referential aspects may need to be considered relationally to achieve sophisticated learning and developmental outcomes. The combination of the two components in relational pedagogy may be a useful way to facilitate the development of epistemological beliefs in further teaching programs.
References


Epistemological beliefs interview questions

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? 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? 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? Do you agree with this person who says that where there are no right answers anybody’s opinion is as good as another’s? Can you think of an opinion that you think is wrong? Are scientists searching for truth? Will they find it?