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Secondary teachers' conceptions of teaching and learning

G.M. Boulton-Lewis *, D.J.H. Smith, A.R. McCrindle, P.C. Burnett, K.J. Campbell

Centre for Cognitive Processes in Learning, Faculty of Education, Queensland University of Technology, Victoria Park Road, Kelvin Grove Q 4059, Australia

Abstract

This paper presents a phenomenographic analysis of the conceptions of teaching and learning held by a sample of 16 secondary school teachers in two Australian schools. It provides descriptions of four categories, derived from pooled data, of the ways in which these teachers thought about teaching and about learning, their teaching strategies, and their focus on student or content. The categories for teaching and learning are described with each teacher allocated to the category most typical of their conceptions of teaching and of learning. The lack of congruence, in some cases, between the conceptions of teaching and of learning held by these teachers is discussed.

1. Teaching and learning

This paper is a description of one aspect of a larger study concerned with secondary teachers' conceptions of teaching and learning, learning environments and the effects on students' learning (Campbell et al., 2000; Dart et al., 1999, 2000). There is a substantial amount of research about university teachers' conceptions of teaching that asserts that qualitatively different approaches to teaching are associated with qualitatively different student approaches to, and outcomes of, learning (Kember 1997, 1998; Trigwell & Prosser, 1996a,b). However, the research in secondary teachers' conceptions of teaching and student learning is limited.

* Corresponding author. Tel.: +617-3864-3118; fax: +617-3864-3987.
E-mail address: g.boulton-lewis@qut.edu.au (G.M. Boulton-Lewis).

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1.1. University teachers' conceptions of teaching

There have been a number of recent investigations which have focused on university teachers' conceptions of teaching and the associated implications for student learning. Thus Kember (1998) found 14 studies in this area which he summarised by identifying common themes. He was able to classify all the studies in tabular form under five categories: imparting information, transmitting structured knowledge, student-teacher interaction, facilitating understanding, and conceptual change/ intellectual development. He then reduced these categories to a three level model based on teacher (lecturer) orientation. These were 'teacher centred/content oriented' and 'student centred/learning-oriented' with an intermediate category which he described as 'student teacher interaction/apprenticeship'. Some of the studies he identified (Martin & Balla, 1991; Dall'Alba, 1991; Samuelowicz & Bain, 1992; Gow & Kember, 1993; Trigwell, Prosser, & Taylor, 1994) are described briefly below along with other research in the area.

Martin and Balla (1991) described three general categories of conceptions of teaching in a continuum from teacher content delivery to student activity and experience as follows: (1) presenting information, (2) encouraging active learning, and (3) learning facilitation. Dall'Alba (1991) interviewed 20 university teachers across four disciplines to determine their conceptions of teaching. She described seven different conceptions: (1) presenting information, (2) transmitting information from teacher to student, (3) illustrating the application of theory to practice, (4) developing concepts and principles through interaction with students, (5) developing the capacity in students to be experts, (6) exploring [with students] ways of understanding from particular perspectives, and (7) bringing about conceptual change in students. The first three conceptions have a teacher focus whilst the last four have an increasing focus on interaction with students.

Samuelowicz and Bain (1992) interviewed 13 academic teachers, and through a process of constant comparative analysis, proposed five conceptions of teaching as: (1) imparting information, (2) transmission of knowledge and attitudes in a discipline, (3) facilitating student understanding of the course content, (4) changing students' conceptions of the world, and (5) supporting students' learning. These conceptions also range from teacher centred activities to genuine collaboration with students to foster their understanding.

Gow and Kember (1993), using interviews and then a questionnaire with university teachers, found two teaching orientations or conceptions which they labelled 'learning facilitation' and 'knowledge transmission'. On the basis of factor analysis they described learning facilitation as being characterised by 'lecturers who conceive of teaching as a facilitative process to help students develop problem solving skills and critical thinking abilities' (p. 28). This orientation usually involves interactive class sessions, lecturers taking a personal interest in students and recognising that they need to provide motivation and stimulate interest. The knowledge transmission orientation was characterised by a focus on the subject rather than student learning; it was seen to be important that the lecturer be a subject expert, teaching involved a

clear and accurate presentation of the subject matter using media and the goals were to prepare the student for the profession. Thus lecturers who most clearly exemplified this orientation may have hardly considered themselves teachers at all, but rather visualised themselves as members of a particular discipline (Becher, 1989, cited in Kember, 1997).

A number of investigations have focused on conceptions of teaching and orientation towards teaching of lecturers in the area of science. Trigwell, Prosser and Taylor (1994) found that the intention of the majority of university science teachers in their sample focused on transmitting information or on students acquiring the necessary concepts. Similarly, Fensham and Marton (1991) found that whereas school chemistry teachers took account of students' perspectives, university chemistry teachers handled the discipline from their own perspective. Both groups, however, were concerned with students learning the basic facts.

In summary, the research described above seems to bear out the existence of two broad teaching orientations ranging from focusing on a teacher/content oriented approach to focusing on a student centred/learning approach and most conceptions of teaching fall within this continuum (Kember, 1997).

1.2. Conceptions of teaching and approaches to learning

Kember (1998) identified links between conceptions of teaching, teaching strategies and students' approaches to learning and concluded that a number of investigations have suggested a relationship from teaching conceptions, through approaches to teaching to student learning outcomes (Kember, 1997, p. 270). For example Trigwell et al. (1994) and Trigwell and Prosser (1996a,b) found a relationship between lecturers' intentions and their teaching strategies, while Gow and Kember (1993) found relationships between lecturers' conceptions of teaching and changes in students' approaches to learning. Sheppard and Gilbert (1991) found a relationship between development of student epistemology, lecturers' theories of teaching, students' perception of the learning environment and their approaches to learning.

Other studies have produced similar results. Trigwell, Prosser and Lyons (1997) found, with large numbers of university science students, that those who adopted deeper approaches to learning were more likely to be taught by staff who adopted approaches that were oriented towards students and developing their understanding. Conversely in classes where teachers described their teaching as a focus on what they themselves do and on transmitting knowledge, students were more likely to adopt a surface approach to learning. However the situation is further complicated by the finding (Prosser & Trigwell, 1997) that students in the same university class do not necessarily experience the same worlds. For example, a student with limited prior knowledge and a surface approach, in a class which is designed to facilitate a deep approach, will see the situation quite differently from a student who has the requisite knowledge and adopts a deep approach. Such differing conceptions of the same classroom by students with differing approaches to learning has also been demonstrated at secondary school level (Campbell, Brownlee, & Smith, 1996).

1.3. Research in school teachers' conceptions of teaching and learning

Patrick (1992) investigated the different ways in which secondary history and physics teachers view and approach the teaching of their disciplines. She described three broad groups of history teachers, based on how they spoke of their subject and how they taught it. The first group, who emphasised delivery of the material, and focused on presentation and technique, perceived the students' relation to the subject matter as unproblematic. The second group saw two phases in the students' learning: first students acquired and accumulated necessary information, and second they interpreted it to achieve understanding, where that understanding was identical with the teacher's and achieved through the teacher's help. The third group saw teaching history as a process of interacting with students to get them to develop their own interpretations from the outset. A parallel set of conceptions was apparent amongst the physics teachers. One group of teachers understood physics as being a set of formulae and related calculations, with learning involving the recall and application of these. A second group saw physics as a practice revolving around a set of theories that provide an explanatory system, and learning consequently related to problem solving. The final group conceptualised physics as a way of understanding the natural world, with learning equated with the construction of such understanding.

Marton and Booth (1997) also described a range of studies of teachers' conceptions of teaching. For example they cited work of Alexandersson (1994a,b) who looked at the way teachers directed their awareness during teaching. He found that some focused on the activity going on at the moment, others were concerned with more general aims whilst others attended only to the content being taught. Marton and Booth also asserted that studies show that school teachers generally focused on pupils rather than content, failed to talk about skills and insights that the subject might foster, and some were concerned mostly with the 'atmosphere' in the classroom.

Other studies of teachers' conceptions of teaching have focused on the metaphors or images in terms of which these conceptions are expressed (e.g., Briscoe, 1993; Calderhead & Robson, 1991; Munby & Russell, 1990; Powell, 1994; Ritchie, 1994; Tobin, 1990, 1993). Such research has shown that the metaphors and images underpinning teachers' beliefs and conceptions relating to teaching influence their teaching and assessment. In this regard, Briscoe contends that for teachers to be able to bring about changes in their assessment methods there has to be consistency between beliefs, metaphors and classroom practice. The salience of metaphors is also stressed by Munby and Russell who assert that teachers holding a range of incompatible metaphors of their teaching role are likely to experience difficulties in approaching their teaching. They described, for example, a teacher who thought of himself both as a captain of a ship and an entertainer and another who saw herself as saintly facilitator, a comedian and a miser. Such mixed metaphors cause inconsistent and confusing behaviours for students when a teacher switches from one metaphor to another.

Currently there appears to be more information available concerning the conceptions of, and orientations towards, teaching of University academics than teachers at

school level, and some discipline areas, particularly science, appear to have featured more prominently in research than other discipline areas. It is likely that there are important differences between the conceptions of teaching held by University teachers and school teachers related both to their professional preparation and the context in which they operate. Thus, as previously stated, Kember (1997, 1998) found that many University academics did not consider themselves as essentially teachers but rather as experts in a particular discipline. It is also probable that the kinds of constraints on translating conceptions of teaching into teaching practices operating in schools are very different from those which may exist in a University context. Thus, reasonably strong evidence of a consistent relationship between teaching beliefs and (reported) teaching practices among University teachers (Kember 1997, 1998; Trigwell & Prosser, 1996a,b) has emerged in these investigations which have examined both teaching beliefs and teaching approaches. The consistency of this relationship at school level is perhaps more problematic. Thus Mellado (1998) points out that some studies have found only a partial relationship between educational conceptions and classroom teaching behaviour. While it appears that there may be less contradiction between the beliefs and practices of experienced teachers, one investigation (cited in Mellado, 1998), indicated that even expert primary school teachers with strong philosophical commitments to constructivism and conceptual change recognised contradictions between their beliefs concerning science teaching and their classroom behaviour.

The present study contributes to the relatively small literature base concerning school teachers' conceptions of teaching and how this relates to their conceptions of students' learning and their reported teaching practices. While it might be expected that teachers' conceptions of teaching would be closely related to their conceptions of student learning, and there is some suggestion in the literature to support this proposition (e.g., Gow & Kember, 1993; Samuelowicz & Bain, 1992), the relationship requires further investigation. The present study makes a contribution in this regard.

2. Method

2.1. Sample

Twenty four secondary school teachers were selected from two schools in Brisbane, Australia. Sixteen of the teachers taught in a state school which drew students predominantly from middle class homes; the other school was a private school with a non-selective admissions policy and relatively low school fees intended to draw students from a wider socio-economic background than most independent schools in the state. The state school included a somewhat higher proportion of students from Asian backgrounds than most state schools in Queensland. The student population in the private school was overwhelmingly drawn from homes where English was the first language. This school placed considerable emphasis on personal development in its mission statement. Both schools were coeducational. The sample of teachers

taught a wide range of subjects and covered all grade levels of the secondary school (Years 8 to 12).

2.2. Procedure

As part of a larger study involving an examination of the degree of congruence between teachers' and their students' conceptions of learning and teaching and their perceptions of the classroom environment (see Campbell et al., 2000; Dart et al. 1999, 2000), each of the teachers was interviewed individually. Interviews were semi-structured, lasted approximately 30–40 min and took place in the schools approximately four months after the commencement of the school year. While interviews focused partly on the teacher's approach to teaching with a nominated class they also aimed at establishing the teacher's broader conceptions of learning and teaching. They explored such questions as how did the teacher teach, what did the teacher want students to learn, how did students learn, what was the purpose of learning in that subject.

Approximately 12 months after the initial interviews, a second interview was conducted with 16 of the original group who had indicated their preparedness to participate in a follow up interview and were available for interviewing (several of the teachers had moved from the schools). The second interview was intended to establish whether the teachers' conceptions of learning and teaching had altered during the intervening year. During that time they had been provided with an individual report which outlined the conceptions of learning, teaching and perceptions of classroom climate evidenced by themselves and their students. Members of the research team had visited each school and explained the findings of each report to each teacher on an individual basis. This feedback was given half way between the two interviews.

Because very little change in conceptions was identified by the teachers themselves or by the researchers in the interviews, the interviews for both times were pooled and analysed as one data set. The present paper therefore focuses on the conceptions of learning and teaching of the 16 teachers who participated in both interviews. Of these 16 teachers, five were teaching in the private school and the remainder were teaching in the state school. All interviews were tape recorded and transcribed before analysis.

2.3. Methods of data analysis

Interview transcripts were examined using a phenomenographic approach, which aims to reveal the qualitatively different ways in which people experience and conceptualise the world around them (Marton, Dall'Alba, & Beaty, 1993; Marton, Watkins, & Tang, 1997). Such an approach has been used to study conceptions of learning both in adults and children (e.g., Pramling, 1983; Saljo, 1979; Marton et al., 1993, 1997). The present study differs from most previous studies in that it attempts to identify conceptions of both learning and teaching rather than learning, alone. Teachers were also asked about the teaching strategies which they used.

In keeping with a phenomenographic approach, each interview transcript was per-

used at least twice by one of the three investigators involved in this analysis. During the second perusal an attempt was made to distinguish qualitatively different conceptions of learning and teaching across participants and to categorise these in terms of the predominant constructs. These independently developed categorisations were then examined by the three investigators and further discussed. Initial categories identified by the three investigators were similar and formed the basis for distinguishing a number of common elements which were then used as an analytical framework for a third reading of each transcript by the same investigator in an attempt to further test the validity of the categories which had been developed. This resulted in further slight modifications to the categories, in particular a more precise identification of the elements included in the category of teaching and learning which has been labelled as 'transformation'. Strategies were also identified for both conceptions of teaching and learning. The investigators then re-examined all 16 transcripts in terms of these categories and used them as a basis for categorising each of the teachers in terms of the dominant conception they held of teaching and of learning. Each teacher was identified by a number (01–16) to preserve anonymity.

3. Results

3.1. Categories of conceptions

The iterative procedure described above resulted in the emergence of four categories for conceptions of learning and four for conceptions of teaching. The four conceptions of teaching and their constituent elements are shown in Table 1 and those of learning in Table 2.

In the first category of teaching, *transmission of content/skills*, teaching is perceived as imparting information or skills to be taken in, where the teacher and the content is in focus and the students are somewhere in the background. The second category of *development of skills/understanding* involves the teacher directing the learning process, with students as participants, with the focus on students achieving the teacher's level of skill and understanding. The third category of *facilitation of understanding* focuses on both the teacher and student involved in the process of working together to construct personal meaning. The fourth category of *transformation* involves the teacher organising the situation to provide the stimulus and then apparently fading into the background for students to take action in extending themselves cognitively/behaviourally/affectively. Goals in this category tend to be broader and less subject-oriented with emphasis on the growth and development of the student as a whole person.

Strategies typically associated with each conception of teaching are also summarised in Table 1. It can be seen that these reported strategies are for the most part consistent with their conceptions. In the first conception, transmission of content/skills, the teacher is involved in telling, giving, repeating. In the second category of development of skills/understanding, strategies reportedly used by the teacher include activities and illustrations. The third category of the teacher as a

Table 1
Conceptions of teaching

Conception of teaching	Description	Examples	
		What	How
Transmission of content/skills (teacher/content focus)	*Teaching is* imparting information or skills *by* telling/giving/repeating	Teach content (02) Imparting information (06) Get over a certain body of knowledge, skills (16) Imparting a skill (09) It would be a matter of trying to bring their knowledge up to where you want them to be, so you can advance it (12)	Tell, describe, show (09) Give the students… (16)(09) If weaknesses… I'm going to keep over and over the same stuff that they've done, I'm going to try to go back a few steps and take it a bit gradually (14) If its new work you present it and they need to practise it (02)
Development of skills/understanding (teacher to student focus)	*Teaching is* developing students' skills/understanding *by* providing/structuring/ guiding/reinforcing/ building/illustrating/ modelling	Raise students to a basic standard (12) I take on the role of helping my students develop a skill (09) I don't believe it's [teaching] simply the imparting of knowledge to be absorbed by students. I believe that it is developing skills in students (11) I try to make sure that they do understand to the level that I think is important (12)	Talk and guide (01) Building on new language (06) Focus on process (01) I've got a very clear idea in my mind as to what they're going to do (12) Pracs… to get the students confident that they can manipulate some of the equipment (12) Show and tell (08) Motivate, reinforce through rewards, challenges (02)

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Table 1 (*continued*)

Conception of teaching	Description	Examples	
		What	How
Facilitation of understanding in student as learner (teacher/student interaction focus)	*Teaching is* facilitating students' learning and understanding *by* working with them/helping/ stimulating/ questioning/probing/ discussing	Facilitating learning (04)(08) Teaching, I think, is facilitating. It's providing the environment which is guiding kids to wonder, and to question, and to want to know and also to share (05) I will only be a facilitator (01) Working with students, helping them to gain understanding (04) To get students to think more deeply (15) They don't want to move out of it and I am trying desperately to make them see there is a whole new world out there if only they will look (07)	Focus on their difficulties, provide help when needed (10) Discussion and questioning to stimulate thought (12) Probe depth of understanding (03) Talk about ways we learn (06) Using a whole lot of tools for thinking, and also metacognition. Getting kids to think about how they think (01) I think the aim of education is to help kids to be aware of their own wisdom, the wisdom they need to know about, the wisdom of others (05) Gradually step back from them (06) My teaching is sort of to facilitate that sort of thinking (07) Group discussion (10)
Transformation of students (student focus)	*Teaching is* developing/extending students cognitively/ behaviourally/ affectively *by providing* opportunities/ experiences/ activities	I think my job is a facilitator of atmosphere and stimulating material, which I either bring in from outside or stimulating material is what they discover from within (05) Helping them develop, reach their full potential (14) If I do have a particularly brilliant student, there's still enough in that task to extend them as well (07) I just hope that it will just broaden their thinking a little, and they'll question a little more than they would (03)	I guess it's providing opportunities to find out more. Providing opportunities for them to explore, to create, to question, to reason, to criticise, it's just providing those opportunities (03) Initially, it was pretty much them – me, and then it's them – them. I get them to do a lot of group work (05) Give choice (01)(03) I want them to be exposed to other people's thinking. I want them to be challenged by other people's thinking (03)

Table 2
Conceptions of learning

Conception of learning	Description	Examples	
		What	How
Acquisition and reproduction of content/skills (content focus)	*Learning is for students to* take in (and use) information/skills *by* listening/rote learning/repetition	I expect that we cover something, that that's internalised and can be given back to me at any time (09) To me learning is about taking in information and remembering it (06) Accumulating knowledge (11) The aim of learning is, of course, for them to retain the information that they are given (02)	I will either tell them what it means or if it's a very concrete thing we'll describe or show or do, something like that. When they go home that night that should be internalised, revised, read again, ready for the next day (09) Rote learning is the basis and perhaps nowhere else is it the basis of what they have to do in class (09) Rote learning (04)(16) Copy notes from the board (11)(15) If I was to stand at the board and show them how to do something, just about everyone would catch onto that (14) Listen, read the text (12)(09) I very much encourage them to use rhymes—stupid rhymes—to help them remember and retain (02) Repetition (06)(13)
Development and application of skills/understanding (competence focus)	*Learning is for students to be* equipped/able/ understand/apply *by* doing practical tasks/relating it to own experience/putting it into practice/solving problems	Having certain skills (16)(07) Equipping oneself (09) Developing basic skills such as spelling and grammar (11) Being able to cope (with German) (02)	Reinforcement and extension exercises (02) Do the task they've been set as well as they can (12) By doing (04) I believe that they learn when they do it themselves, when they tackle the task (15) Follow the steps (15) Practice (15)

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Table 2 (*continued*)

Conception of learning	Description	Examples	
		What	How
Development of understanding in student as learner (meaning focus)	*Learning is when students* develop/discover/ construct mental frameworks/concepts/ understanding *by* discussion/groupwork/ thinking/metacognition	Developing a framework (10) Developing a mental construct (04) Able to make judgments based on reasonable arguments and evidence (10) Learning is the application of knowledge in a new situation… recognising that concept in a new situation or applying it in a new situation (15) I don't like to give answers… I would prefer to ask them another question so they do the work… they're the ones who glean the knowledge (15) Constructing their own understanding—different for each student (13) Able to work by themselves (07)	Groupwork, discussion, construct together (11) My basic view of learning is students thinking deeply about the issues, about the concepts that you're teaching (05) Take responsibility for own learning (16)(15) Learning is their responsibility… finding out something new everyday doesn't have to be told them (15) Metacognitive awareness exercises (05)
Transformation of learners (growth focus)	*Learning is when students* grow/change/ developcognitively/ behaviourally/ affectively *by* exploring/discovering/ risking/questioning/ reasoning/criticizing/ succeeding	Helping students see themselves in a different light (05) I reckon the outcomes are the rounded person that we help them to create of themselves, which includes the intellectual (05) Lead them into seeing what else they could do (07)	Wide range of strategies (05) There's a lot of student centred activities, so a lot of their learning I hope, is through interaction with one another, through listening to one another, hopefully through my questioning (03) Groupwork… by listening to other people's thought processes they realise, yeah, there's a whole other world out there and I could try that track (11) Student focus (08) …that they feel safe in the classroom, safe to take risks (03) Approaching from different directions (07) Creative exercises (03)

facilitator of understanding, includes strategies of questioning and discussion to stimulate thought and understanding in students. The fourth category of transformation involves the teacher using strategies which provide opportunities and experiences for students to extend and develop.

The four categories of conceptions of student learning are summarised in Table 2. In the first category of learning, *acquisition and reproduction of content/skills*, the focus is on the content/skills which the learner is taking in and practising. The second category of *development and application of skills/understanding* involves the learner as a participant in the learning process which is to achieve competence in a nominated subject area by teacher instruction. The third category, *development of understanding*, focuses on the learner working with the teacher in the process of constructing meaning. The fourth category of *transformation* focuses on the learner as a whole person engaged in growing cognitively/behaviourally/affectively.

Strategies associated with the conceptions of learning are also described in Table 2. It can be seen that in the first conception, acquisition and reproduction of content/skills, the learner is largely involved in rote and reproductive learning. In the second category of development and application of skills/understanding, the learner is involved in practical application. The third category where the learner is developing understanding, is characterised by active involvement of the learner in thinking, questioning, discussing and making personal meaning. The fourth category of transformation involves the growth of the learner as a person through student-centred activities involving exploring, questioning, and risk-taking.

3.2. Relationship between conceptions of teaching and conceptions of learning

Teachers were then allocated to their most typical conceptions of teaching and learning. See Table 3. Each teacher made statements about teaching and learning which fell into more than one category but they tended to have a dominant perspective as illustrated by the frequency and strength of the comments they made and how central they seemed to be to the teacher's educational philosophy.

It can be seen in Table 3 that most of the teachers (12), that is those represented in the diagonal axis across the table, held predominantly congruent conceptions of teaching and student learning. Four of them, who believed predominantly that teaching was transmission of content or skills in a subject area, thought that student learning depended on acquisition and reproduction of the content or skills. Two, whose predominant conception of teaching was development of skills and understanding, also thought that this constituted learning. Three believed that teaching was facilitating students' understanding and that learning was the development of personal understanding. Finally, three teachers believed that the purpose of teaching was to transform the students as people and that transformation also constituted learning. These results are in keeping with links that have been proposed and described previously between teachers' conceptions of teaching and their strategies, although in this case the link is between their conceptions of teaching and student learning.

Table 3
Most typical conception of teaching and learning expressed by teachers

	Conceptions of teaching			
	Transmission of content/skills	Development of skills/understanding	Facilitation of understanding in student as learner	Transformation of students
Concepts of learning				
Acquisition and reproduction of content/skills	02; 06; 09; 16	14	10	
Development and application of skills/understanding		12; 11	13; 08	
Development of understanding in student as learner			15; 04; 01	
Transformation of learners				07; 03; 05

While not the focus of the study, closer examination of Table 3 revealed an interesting relationship between teachers' conceptions of teaching and learning and the subject matter they were teaching, which might indicate that the more sophisticated conceptions of teaching and learning are more likely to be adopted in relation to some subject areas than others. The four teachers who believed that teaching primarily involved the transmission of content or skills, and that learning depended on the acquisition and reproduction of these, were the four second language teachers in the sample (02, 06, 09, 16). In contrast, the three mathematics teachers (04, 08, 14) and the two science teachers (12, 15) in the sample, displayed differing intermediate conceptions of teaching and learning. Their views of teaching ranged from the development of skills and understanding to the facilitation of understanding, and their views on learning varied from acquisition and reproduction to the development of understanding.

This range of conceptions within the science/mathematics teachers is similar to that found by Patrick (1992), Trigwell et al. (1994) and Fensham and Marton (1991). In none of these studies was the fourth conception of transformation espoused. The three teachers in the present study who did conceive of teaching and learning as transformation (03, 05, 07), taught English Literature, Personal and Spiritual Development, and Art respectively. It may be that this fourth conception, with its emphasis on the development of a person as a whole and its reduced content orientation, is more likely to be developed in the context of subjects which are more obviously open to individual interpretations, requiring personal understanding, than in subjects such as mathematics, science and second language learning where there is an appar-

ently established knowledge base and set of skills which must be acquired in order to succeed in the subject.

4. Discussion

It should be noted that there were four teachers whose conceptions of teaching and what constitutes learning were not congruent. All these teachers held more sophisticated conceptions of teaching than their conceptions of learning. The first teacher (14) believed that teaching meant development of skills and understanding but learning was acquiring and reproducing content and skills. Teacher 10 held a similar conception of learning to 14 but was concerned with student-teacher interaction to facilitate student understanding. Finally, two of the teachers (13 and 08) believed that teaching was a process of facilitating student understanding through interaction but believed that learning was a matter mostly of development and application of the skills and understanding. These four teachers apparently had higher goals for their teaching than for the outcomes of student learning. The minor inconsistencies displayed by these teachers suggests that one cannot assume that teachers' conceptions of teaching will necessarily be consistent with their conceptions of learning, These teachers may be aligned with those teachers who were found by Munby and Russell (1990) to use mixed metaphors to describe teaching.

As stated earlier very little change in conceptions of teaching and learning was identified by the teachers themselves or by the investigators in the interviews. A few said that the reports and discussions with the project team had confirmed their earlier beliefs; some said that they had thought about both aspects of teaching and learning a little more but still continued to function as they had before; and others said that they had introduced one or two innovative strategies into their teaching. Therefore it was decided that it would not be informative to analyse the data in terms of change.

The lack of any substantial change in the conceptions of these teachers is not surprising. Gow and Kember (1993), on the basis of research in university teaching, made the point that altering conceptions is not a task to be underestimated. They suggested (cf. Nussbaum & Novick, 1992; West, 1988) that a three phase process involving diagnosing conceptual frameworks, a period of disequilibrium and conceptual conflict and then reconstruction and reformation is necessary. They suggested involving teachers in reflection on their own teaching in action research projects. In order to cause any significant change in secondary teachers' well established and well practised conceptions of teaching and learning it would seem that a more carefully thought out intervention would need to take place than occurred in this project and that there would need to be some strong motivation for the teachers to want to change their beliefs.

In this paper four conceptions of teaching and four conceptions about student learning held by school teachers have been identified and defined. The conceptions of teaching are similar in range to those proposed for university teachers. They move from a focus on transmitting content, then developing basic skills and understanding,

to interaction between student and teacher to further develop personal meaning and understanding, to the student changing as a person. These parallel the five main categories that Kember (1998) proposed from his summary of studies in university teachers' conceptions of learning which ranged from imparting information to conceptual/intellectual change. They are also similar to Patrick's (1992) findings for history and physics teachers: that is in history, from delivery of content to getting students to develop their own interpretations; and in physics, for students to recall and apply formulae through to students learning to understand phenomena. However, three of the teachers in this study had a conception that went beyond the subject matter to actually changing the students as people.

There was no clear evidence in these results, as suggested by Marton and Booth (1997), that most school teachers are mainly concerned with students rather than subject matter. The focus in this study for more than half the teachers was on subject/content matter and the acquisition and application of it. The conceptions of learning were similar to those for teaching in that they move from reproduction of content, through acquisition and application of basic competence, to actively making meaning, to changing as a person. The fact that teachers' conceptions of teaching and learning are not always consistent is interesting but not surprising. It indicates that it cannot be assumed that what teachers say about learning is necessarily in keeping with what they believe about teaching.

The results of the present study indicate that teachers' reported teaching practices are generally consonant with their beliefs about teaching, but it should be noted that teachers' reported practices may not reflect accurately their actual practices (Campbell et al., 1996). It may well be that teachers' descriptions of their classroom practices selectively favour those which are consistent with their professed beliefs about teaching, a factor which needs to be taken into account in any program focusing on developing changes in teacher beliefs concerning teaching.

In summary, the findings are broadly consistent with the view that conceptions of teaching are best thought of in terms of a continuum of dominant conceptions (Samuelowicz & Bain, 1992; Kember, 1997) ranging from teacher centred transmission of knowledge to a student centred focus involving transformation of the learners. The results also suggest that while teachers' conceptions of student learning are generally consistent with their conceptions of teaching, there may be discrepancies particularly in the case of teachers with the most sophisticated conceptions of teaching. Such teachers' conceptions of student learning may be less constructivist than their conceptions of teaching, a finding suggesting that even teachers whose conceptions of teaching are relatively sophisticated may well gain considerable benefit from professional development programs focusing on the nature of students' learning.

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