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Conceptions of teaching and learning at school and university: Similarities, differences, relationships and contextual factors

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This paper is a discussion of the relationships between and within conceptions of teaching and learning in schools and universities. It becomes apparent that generally and statistically there is congruence between conceptions of learning and approaches to it and between conceptions of teaching and strategies at all levels and across contexts. There is also generally congruence between conceptions of teaching and learning. However when one looks closely at some studies, it is possible to determine pockets of dissonance in the relationships. This is important to recognise because it influences teaching and learning and outcomes for students and teachers. There are also similarities and differences across cultural contexts, discipline areas and levels of education.

The study of conceptions

Most of the conceptions of teaching and learning discussed in this paper are derived from phenomenographical research although a few studies have different theoretical perspectives or methodology. Some have operationalised the conceptions and developed inventories whilst others have combined interviews and questionnaires. Phenomenography is a qualitative methodology that is empirically based and aims to identify the different ways (or variations in the ways) in which people experience, conceptualise, perceive or understand various phenomena (Marton, 1988). Marton and colleagues in Gothenburg have developed this approach over about 30 years. It was originally applied to understanding student learning and has since been used in other discipline areas. The focus of the methodology is directed towards determining categories of conceptions of a phenomenon such as learning. The categories are derived from the data (usually individual interviews) and illustrated and supported by excerpts from them. The categories are descriptions of the ways in which a specific phenomenon appears to a group of people. They are usually presented in a hierarchy in which the descriptions are delimited structurally and referentially from each other. The presentation of the categories is often in a form described as an outcome space. A well known set of hierarchical categories of conceptions is that proposed by Marton, Dall'Alba & Beaty (1993) for learning by Open University students in the United Kingdom. They were as follows: A. Increasing one's knowledge, B. Memorizing and reproducing, C. Applying, D. Understanding, E. Seeing something in a different way, and F. Changing as a person. In this outcome space all the interview data were reduced to six essential different ways in which the particular group of university students experienced learning. They were delimited and supported by quotes from the interviews.

Richardson (1999) highlighted some limitations of and warnings about phenomenography which include its reliance on participant and researcher interpretations, contextualisation of experiences, need for authentic communication,

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the possibility of different researchers arriving at different categories, and the fact that samples are usually small so that one cannot generalise from the results. Nevertheless the methodology is a unique way of describing the range of different ways in which people experience a phenomenon and has been very useful, as explained below, in research in teaching and learning at different levels of education and in a range of contexts. As Sandberg (1994) suggested the more faithful we, as researchers, can be to individuals' conceptions of an aspect of reality, the better we are able to understand learning, teaching and other kinds of human action within society.

This work originated in a Western context in universities but recently it has been undertaken in different cultural contexts and in schools. A decision has been made to sample only some of the research in conceptions in universities and focus where possible on work in schools.

Students' conceptions of learning

At university

The basis for work in conceptions of learning began in Sweden with university students (Saljo, 1975; Marton & Saljo, 1976a, 1976b). Students were asked to read parts of chapters in an educational textbook. The intention of the study was to find out what they understood of the text. After reading the students were questioned and their responses were analysed. The outcome of the analysis was four distinctively different ways of making sense of the text which were hierarchical and ranged from surface to deep approaches. Deep approaches led to understanding the author's message and surface approaches were related to misunderstanding. This was the beginning of a series of studies and on the basis of the results Saljo (1982) claimed that there was a relationship between general experiences of learning (conceptions) and ways of reading a text (approaches), thus congruence. Similar relationships between conceptions and approaches to learning have been proposed by other researchers (e.g. Marton, 1988; Trigwell and Prosser, 1991; van Rossum & Schenk, 1984). In later work Saljo (1979) identified five qualitatively distinct ways of experiencing learning. These were expanded by Marton et al. (1993) to six conceptions as described earlier. The latter study with adult students in the United Kingdom produced an extra category – F. Changing as a person. The categories are posited as hierarchical and inclusive. The lowest category A is concerned with getting facts and information. B is different in that the focus is on getting information to reproduce it for a purpose. In C the focus is widened to include using and applying the information at some future date. These three lower categories, of conceptions of what constitutes learning, are all quantitative and surface in nature. The next three categories D, E and F are focused on the qualitative aspects of learning at a deep level and are concerned with understanding. D is understanding by comparing, contrasting and making meaning; E is seeing something in a new way as a result of learning, and F is a view that the effect of learning is actually to change the person.

In a longitudinal series of studies with Australian Aboriginal university students across disciplines Boulton-Lewis and others (Boulton-Lewis, Marton, Lewis & Wilss, 2000a, 2000b, 2004; Boulton-Lewis, Lewis & Wilss 2001) found categories of conceptions of learning similar to, but a little different from, those proposed by Marton et al. (1993). With first year students in the study (2000a, 2000b) there were three main categories with subcategories. They were 1. acquiring knowledge (a.

increasing and b. using), 2. understanding (a. to acquire, b. to use, c. to relate, analyse and elaborate) and 3. personal growth. For the most part, the strategies these students used did not match/were not congruent with their conceptions. Boulton-Lewis, et al. (2001) analysed the data for two years of the study and identified a set of categories of core conceptions for each year. The conceptions for the second year for the group were similar to those for the first year but two new conceptions were identified. These were 4. to see something differently and 5. a change in thinking and understanding. On an individual basis there were changes in some students' awareness of learning. In analysing the data for the three years (Boulton-Lewis et al., 2004) it was decided after further consideration that the results could be described in a similar way to those identified by Marton et al. (1993) although there were still minor differences, including an emphasis on understanding, even with the lowest conception. For some students, contrary to findings in Sweden and the United Kingdom, there was dissonance between conceptions and approaches to learning. Most of this dissonance was caused by students voicing higher level conceptions than the strategies they used for learning. Over the 3 years of the study one third of the students exhibited consistently dissonant conceptions and strategies. The use of strategies that were at a lower level than their conceptions constrained their learning to a certain extent although this was compensated for by their strong motivation to obtain a qualification. The question of dissonance is addressed further in Boulton-Lewis et al. (2003). This group of students generally held lower level quantitative conceptions of learning and related strategies than other university students however there were some moves to higher level conceptions and strategies over three years of study.

Similar studies have been undertaken with groups of university students from other cultural backgrounds. For example with distance learners at the University of the South Pacific, Mugler and Landbeck (2000) found what could be interpreted as 'levels of understanding'. Most students explained understanding as 'knowing the content' or 'knowing how to do something' while some stated that understanding was 'knowing the meaning of subject matter'. This is similar to the three kinds of understanding described by Boulton-Lewis et al. Dahlin and Regmi (1995) interviewed both Nepali university students and secondary school students. They found conceptions similar to the original six described by Marton et al. (1993) but with different levels of memorising, more emphasis on meaning, more linkage between understanding and memorising and conceptions of the results of learning as 'a change of behaviour, a change of consciousness or understanding, or change in both'. These last 'change' conceptions are a little like the 4th and 5th conceptions found for Aboriginal students (2001). Dahlin and Regmi proposed that culture does not determine the content of the learning experience in an absolute sense but that it does influence those aspects of the experience that are accentuated. Meyer and Boulton-Lewis (1999) operationalised conceptions of learning and other associated aspects in an inventory (RoLI) which was used with Australian, Indonesian and South African students. The results indicated that conceptions of learning are associated with cultural and experiential factors.

Eklund-Myrskog (1998) found similarities and differences between students' conceptions of learning in two different educational contexts; student nurses and car mechanics. Differences between programs were greater than within programs with only two conceptions common to both student groups. The majority of the nursing

students had a qualitative view of learning whilst the majority of the car mechanic students had a quantitative view. All students however had more developed conceptions at the end of their course. She states that the results showed that to some extent conceptions were contextually dependent.

From a different perspective Tynjala (1997) investigated the conceptions of the dimension of the learning *process* held by educational psychology students in a Finnish university. The set of seven conceptions that she proposed are interesting in that they are more concerned with how the student learns and what the student does to learn than what the student believes learning to be. These conceptions range from considering learning as an externally determined process to a creative process, are semi-hierarchical and not necessarily mutually exclusive at the individual level. Of course even with a hierarchical set of conceptions, where students are then allocated to the category that fits them best, it is still likely that an individual will hold a range of conceptions.

The studies described above provide conceptions of learning across countries, courses and dimensions. Despite differences in emphasis and numbers of conceptions of learning in different contexts there is overlap and remarkable consistency with the original conceptions proposed by Marton et al. (1993). They all range from quantitative conceptions of learning usually associated with surface strategies to qualitative conceptions which are associated with deep strategies and an intention to understand. Marton et al. (1997) suggested that the structure of the experience of learning in formal settings may be more or less universal. However this may simply reflect the culture of such institutions. Entwistle (1997) believes that as students progress through a course their conceptions will generally move from one of acquiring 'discrete packages of information' to one that constitutes change in themselves and the world around them and this seems to be borne out by most of the studies described above.

At school

in a written answer study with 150 14-16 year old Nigerian secondary students, Watkins and Akande (1994), found four clear categories of descriptions of learning which were learning as; increasing knowledge (held by 47.4% of the respondents), memorising and reproducing (8.9%), applying (17%), and understanding (26.7%). They suggest that these four categories were congruent with the first four described by Marton et al. (1993). In summary they proposed that the 'quantitative memorising conception of learning and the conception of learning as understanding are identifiable in the responses of these Nigerian secondary school students'. They also cite other Nigerian studies (Omokhodion, 1989, Ehindero, 1990) which found similar distinctions between reproductive and meaning oriented conceptions of learning. Watkins (1996) undertook further research with 20 junior and 24 senior secondary school students in Hong Kong with an emphasis on developmental aspects of learning. He described four stages of intentions to learn which he linked with strategy, assessment, locus [of control], metacognitive [developmental] level and workload. The stages of intentions, and associated strategies in parenthesis, were 1. Achievement through reproduction (rote memorising), 2. Achievement through reproduction (rote learn important things) 3. Achievement through reproduction (understand then memorize), and 4. Understanding and achievement (combine understanding and memorising OR focus on understanding). He made some

important points about this sequence when he says the Chinese skill at memorising and the focus on it continue until the early years in secondary school until the amount to be learned becomes excessive so that at the stage 2 level students only memorised important things. By stage 3 they were combining memorising and understanding. He proposed that other factors influencing this progression were problems with the English language, levels of cognitive development, assessment rewards and self confidence.

A detailed analysis of continuities and discontinuities in learning by Chinese school children aged 12 to 18 years was undertaken by Marton, Watkins and Tang (1997). They found that the data could be depicted in an outcome space which showed four distinct ways of experiencing learning. These ranged from two conceptions of committing to memory (words or meaning) to two conceptions of learning as understanding (the meaning or a phenomenon). There is a clear distinction between the two lower conceptions which are focussed on committing information to memory and the two higher conceptions which are concerned with meaning. The object of learning also ranged from words to meanings, to phenomena. The outcome space included a temporal facet to each of these ways of experiencing which moved from acquiring, to knowing, to using. For example in memorising words the first step was to memorise, the next step was to remember and the final stage was to reproduce. In understanding meaning the sequence was to first gain understanding, then remember meaning and finally to be able to do something, do something differently or do something different. There are some minor variations in these results from other categories of conceptions in that understanding precedes memorising in the temporal facet of understanding meaning.

Dart, Burnett, Purdie and Boulton-Lewis (2000) found a relationship between qualitative conceptions and deep learning and quantitative conceptions and surface learning in a group of high school students in Australia. However, they also found a positive relationship between quantitative conceptions of learning and a deep approach and that the conceptions and approaches were affected by context.

Klatter, Lodewijks, and Arnoutse (2001) described learning conceptions, or beliefs, about different aspects of learning, held by students in the final year of primary school in the Netherlands. They firstly interviewed 27 students about their learning and then a questionnaire was developed to determine the interrelatedness of beliefs about selected aspects. They implemented the questionnaire with 367 sixth graders. In the qualitative part of the study they found different beliefs about five aspects of learning; purpose of school, learning orientation, regulation, functional learning, and developmental learning. These conceptions are different from the usual phenomenographic ones and the authors argue that they have redefined a learning conception as a multidimensional construct to include cognitive and affective components on one dimension. In the qualitative part of the study they asserted that three different types of learning conceptions could be identified '...a restricted learning conception characterised by a relatively low commitment to different kinds of beliefs, a functional learning conception, characterised by ego-orientation and external regulation for future success, and a developmental learning conception which is characterised by emphasis on personal growth and a deep approach to the learning process.' They also found as one of their results that young pupils are not used to talking about learning as such but became more enthusiastic when they realised their

discussions were confidential and that they could say whatever they liked. This can also be the case with university students who have not thought about learning explicitly. Boulton- Lewis et al. in their studies found that some of the Aboriginal students were not able to talk at length about learning until the second or third year of the study and spoke more easily to an Aboriginal research assistant who was not directly connected to their lecturers.

Purdie and Hattie (2002) developed an instrument from qualitative data, obtained with Australian and Japanese students, to assess conceptions of learning (COLI) which they implemented with Australian (Indigenous and non-Indigenous), Malaysian and American (Caucasian and African) high school students. They found a relationship between self-reported higher academic achievement and endorsement of all six conceptions of learning and not much support for two qualitatively different sets of conceptions, that is deep and surface, particularly with Asian students. They also raised the issue of the importance of motivation in learning and in determining what is important, despite conceptions and the strategies students possess or choose to use. They proposed six conceptions as follows; a) gaining information, b) remembering, using and understanding information, c) duty, d) personal change, e) a process not bound by time and place, and f) social competence. Conceptions a, b and d are similar to those identified in other studies and constitute experiences of what learning [cognitively] is thought to be. They fit with the phenomenographic view of conceptions where the concern is with experiences of a phenomenon in one dimension, in this case the cognitive aspect. Conceptions c, e and f are concerned with different aspects of learning; c) with affect, d) with temporal factors and f) with social factors. Hence, whilst they are all justifiable ways of thinking about learning they do not fit together well as one overall hierarchical set of conceptions.

In the research in conceptions of learning in school and university one can identify a developmental perspective. The studies with school students mostly show two distinct sets of conceptions concerned with either memorising or understanding, often with the emphasis on memorising of one kind or another. The conceptions for university students are augmented by more advanced qualitative conceptions which encompass seeing something in a different way or actually changing as a person. These more advanced conceptions are not always apparent at the beginning of university study for non-Western students or for those such as the Aboriginal students who, in many cases have had a less than satisfactory secondary school experience. It is suggested that the apparent developmental sequence for conceptions of learning and congruent strategies is affected by context, general cognitive development, by acquisition of content knowledge and by challenges to learn more about learning. Generally students who hold higher conceptions of learning and approaches can orchestrate the whole range depending on the context and their motivation. Students who hold only lower level conceptions and approaches are limited to using those.

Lecturers' conceptions of student learning

Bruce and Gerber (1995) conducted a study of lecturers' conceptions of student learning in university. Unfortunately they did not link it empirically to their conceptions of teaching although they hypothesised about the relationships. They found six conceptions of learning (abbreviated) as follows; 1. acquiring knowledge, 2. absorption of knowledge to explain or apply, 3. developing thinking skills and the

ability to reason, 4. developing the competencies of beginning professionals, 5. changing attitudes, beliefs and behaviours, and 6. a participative pedagogic experience. They suggest that the first and last categories may be due to personal and contextual factors. The first because some of the participants were new to university teaching and the last because there was an emphasis on staff development for learning and teaching in the university where the study was conducted. They assert that the remaining categories are similar to those for teaching and learning proposed by others. They suggest that it is likely that lecturers' conceptions of teaching and learning are related. This is generally likely to be true but there will also probably be dissonance as found in the school study by Boulton-Lewis et al. (2001) described later.

Newton, Newton and Oberski (1998) investigated learning and conceptions of understanding in history and science held by lecturers and graduates. They argue that understanding is a significant indicator of the quality of student learning. It can allow learners to explain, justify and predict; recall or reconstruct information; enable independent interaction with the world and facilitate the construction of further understanding. It is a component of the higher levels of conceptions of learning proposed by Marton et al. (1993). Newton et al. (1998) found two conceptions of understanding in science; a capability to apply laws, and acquisition of a mental structure to explain these. The main conception in history was the reconstruction of events. Some of the lecturers' and students' conceptions were similar. However they make the point that when the students' conceptions do not match those of the lecturers there is potential for learning difficulties because, for example, the lecturer may be aware of knowledge that the students barely understand or, on the other hand, it may be easy for the students to meet the lecturers' expectations without understanding. They suggest that students and lecturers should make explicit their awareness of understanding in order for some kind of shared meaning about learning to be developed.

Conceptions of teaching

At university

Kember (1998) summarised 14 studies of conceptions of teaching in higher education. These included, among others, work by Martin and Balla (1991), Dall'Alba (1991), Samuelowicz and Bain (1992), Gow and Kember (1993), and Trigwell, Prosser and Taylor (1994). They were mostly phenomenographic studies. Kember was able to classify the studies into five categories which he then reduced to three based on teacher (lecturer) orientation. These were 'teacher centred/content oriented' and 'student centred/learning oriented' with an intermediate category that he described as 'student teacher interaction/apprenticeship'. It is usually assumed that the student centred/learning oriented conception is the most effective for learning however it depends in part how this is operationalised. If students can be supported so that they take control of their learning and hence construct their own knowledge then such an approach should lead to deep learning. However, if students lack the prerequisite skills and knowledge, or motivation to behave in this way, then they can be ineffective as learners and become very frustrated. In such cases they probably need more scaffolding of their learning or, initially, a teacher centred/content oriented approach.

It is assumed that teachers' conceptions of teaching will be aligned with, thus congruent with, their teaching approaches and strategies. For example Trigwell and Prosser (1996) confirmed statistically the congruence between intention and strategy in a study with first year science teachers. They suggested however that content and approach may be context dependent and that academic development focussing only on strategies is unlikely to be successful unless there is also a focus on the intentions associated with the strategy.

At school

Most of the research in conceptions of teaching has been undertaken in universities however two studies in secondary schools are summarised here, one in China and one in Australia. The second study also investigated the relationship between the teachers' conceptions of teaching and their conceptions of student learning.

Lingbao and Watkins (2001) identified and assessed the conceptions of teaching held by secondary school physics teachers in China through interviews with 18 teachers, aided by episodes of classroom teaching processes, and an inventory developed from the interviews and used with 450 teachers. They identified five lower order conceptions of teaching which included knowledge delivery, exam preparation, ability development, attitude promotion and conduct guidance. These could be grouped in a higher order framework which focussed on moulding at the lower level to cultivating at the higher level. The results focus on more than one dimension and are therefore different from but similar to the usual conceptions of teaching described in the Western literature. It is proposed that this is probably due to cultural factors which emphasise an affective, moral view of teaching and the context of the school with an emphasis on examinations. They found that neither teaching experience nor gender were related to the conceptions. Most of the teachers responded positively to all the conceptions of teaching which implied that they held multiple conceptions. They explained why they shifted their conceptions during interviews by the fact that they had ideal conceptions about teaching and practical conceptions reflecting the school environment. The authors argued that this is evidence that teachers might support conflicting conceptions.

Boulton-Lewis, Smith, McCrindle, Burnett and Campbell (2001) investigated 16 secondary school teachers' conceptions of teaching and student learning. They found four categories of the way in which teachers thought about teaching and student learning, the related strategies, and a focus on either content or student. The conceptions of teaching were; transmission of content/skills, development of skills/understanding, facilitation of understanding, and transformation (of students). The focus of these ranged from teaching content to change in students. Their conceptions of student learning were; acquisition and reproduction of content/skills, development and application of skills/understanding, development of understanding, and transformation of learners. Their conceptions of student learning also ranged from a focus on learners to a focus on content. Each teacher was then allocated to the category most typical of their conceptions of teaching and learning respectively. There was a lack of congruence in some cases between the conceptions they held. Notably there were four teachers ($\frac{1}{4}$ of the sample) whose conceptions of teaching and learning were not congruent. These four teachers held more sophisticated conceptions of teaching than their conceptions of learning. For example one teacher believed that teaching meant development of skills and understanding but that

learning was acquiring and reproducing content and skills. Another teacher held a similar conception of learning but was concerned with student-teacher interaction to facilitate student understanding. The other two teachers 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 had higher goals for their teaching than for the outcomes of student learning. The inconsistencies displayed by these teachers suggest that one cannot assume that teachers' conceptions of teaching will necessarily be aligned with their conceptions of student learning.

Relationships between conceptions and approaches to learning and teaching

Cano (2004, submitted) has undertaken a detailed study of consonance and dissonance in European secondary school students' experience of learning. A sample of 1012 students from grades 7 to 12 were asked to respond to open ended questions and undertake the LPQ (Learning Process Questionnaire, Biggs; 1987) which measures surface motive and strategy, deep motive and strategy, and achieving motive and strategy. He found consonant and dissonant patterns in approaches to learning as well as in learning conceptions and strategies. There were two kinds of consonance (basic and complex) and two kinds of dissonance (negative and positive). The patterns of responses were significantly related to differences in performance. Positive dissonance (reproducing conceptions and higher level organisation/elaboration strategies) and complex consonance (deep conceptions and strategies) were associated with better results.

Studies by Boulton-Lewis and others, described above, found dissonance in the learning of some Aboriginal university students' conceptions and approaches to learning and in teachers' conceptions of teaching and learning. The dissonance for Aboriginal students was of the kind that Cano (2004) described as negative, that is students held higher level conceptions than strategies, however they managed to succeed through enormous effort. More congruence between conceptions and strategies consonance would have made their studies more rewarding.

In a complex study (2002) of the relationship between university assistants' conceptions of knowledge, learning and instruction Buelens, Clement and Clarebout concluded that a relative conception of knowledge goes with a meaning-oriented conception of learning as well as with a student-oriented conception of instruction. On the other hand an absolute conception of knowledge is statistically related to reproduction-oriented learning and teacher-centred instruction. They also proposed that student-oriented conceptions of instruction are present early in a teaching career rather than necessarily being the product of experience and development popular in the literature.

Using interviews and a questionnaire with a sample of business lecturers, Murray and MacDonald (1997) found, that their expressed attitudes and beliefs about teaching were not translated into teaching strategies and beliefs. Most of the lecturers' considered themselves to be facilitators of student learning or student supporters. However this was inconsistent with their views of lectures and tutorials which were to disseminate information, and apply or check knowledge or understanding. They refer to this disjunction, that is of beliefs not translated into teaching strategies and

methods, in terms used by Samuelowicz and Bain (1992) as one of the mysteries of higher education. They also liken it to work by Argyris and Schon (1978) who described the gap between espoused theory and theory in practice. It appeared also that the lecturers held multiple conceptions of their roles. They suggested that the differences between the ideal and the practical might have been caused by contextual factors such as large numbers of students or shortage of resources.

Trigwell and Prosser (1996) found strong relations between conceptions of teaching and approaches to teaching for a sample of physics and chemistry lecturers in Australia although relations between conceptions of teaching and learning were not so strong.

It is apparent from the studies described above that there is usually a strong relationship between conceptions of learning and teaching and the approaches that lecturers and students adopt. However in some cases there is dissonance and in these situations the teaching or learning is usually not as effective.

Similarities, differences, and contextual factors

It might appear from this review that the results are inconsistent and confusing. There is certainly a complicated mixture of methodologies and results. However, despite that, common themes emerge across levels of education and cultures. In addition, in most of the studies of conceptions of learning and teaching, a range of related or overlapping categories of description have been identified.

In the studies of conceptions of learning at university there are two major perspectives, that is a quantitative view and a qualitative one. There are differences in some of the studies however between the conceptions held by students from different disciplines or cultural backgrounds. In the work dealing with processes of learning there is a demarcation, between considering learning as externally determined or as a creative process, which fits with the quantitative and qualitative conceptions of what learning is.

In the limited research in conceptions of learning held by school students there is congruence with the conceptions of learning found for university students with distinctions between a focus on reproduction or meaning making but usually without the higher level qualitative conceptions.

Lecturers' conceptions of student learning fit to a certain extent with student conceptions however there are some discipline differences.

There are a large number of studies of conceptions of teaching at university some of which have been reduced by Kember (1998) to 3 major groupings which focus on teacher and content, or student and learning, with an intermediate category of student teacher interaction.

The research on conceptions of teaching in schools produces lower and higher level conceptions with congruence generally between them and learning. However, here there are also differences due to cultural contexts and between beliefs and action.

Implications for teachers and students

Teachers

Because the research described above suggests that students will hold a range of conceptions of learning that will influence their performance there is a need for teachers to be aware of these, of their likely developmental sequence, and how they might be affected by culture and context. Teachers also need to be explicitly aware of their own conceptions of teaching and student learning and try to ensure that there is congruence between them, or alternatively be flexible depending on the context and student requirements. It would be helpful if teachers made their perspectives on teaching and learning as explicit as possible to students and explained their reasons for them. They will also be more effective if they plan their teaching so that conceptions of teaching and learning, and strategies and expectations are congruent or aligned as described by Biggs (1996).

Students should be helped to become aware of their conceptions of learning and the relationship between these and approaches to learning. They should ideally develop a range of deep and surface strategies which they can control in a metacognitive fashion to regulate their own learning depending on the context and their motivation and goals. Basically it is suggested that we must help students at all levels to learn about learning. It would also be useful if they could be helped to understand the kind of teaching that they are experiencing to decide whether this fits with their needs or whether they would prefer to learn in some other way, hence taking control of their own learning and the learning environment as far as possible.

Conclusion

The research in conceptions makes it clear that, whilst there may be accepted better ways of learning and teaching, students and teachers do not always accept or operate with these. The suggestions above assume a strong commitment on the part of students and teachers to embracing better ways of teaching and learning however it is important to realise that there will be a range of other beliefs and expectations. Such a realisation is part of the way to being able to deal effectively with such beliefs, expectations and behaviour in order to improve learning for most students.

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