



Relations between teachers' approaches to teaching and students' approaches to learning

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Abstract. This paper reports on an empirical study which shows that qualitatively different approaches to teaching are associated with qualitatively different approaches to learning. More specifically, the results indicate that in the classes where teachers describe their approach to teaching as having a focus on what they do and on transmitting knowledge, students are more likely to report that they adopt a surface approach to the learning of that subject. Conversely, but less strongly, in the classes where students report adopting significantly deeper approaches to learning, teaching staff report adopting approaches to teaching that are more oriented towards students and to changing the students' conceptions. The study made use of a teaching approach inventory derived from interviews with academic staff, and a modified approach to learning questionnaire. These conclusions are derived from a factor and cluster analysis of 48 classes (involving 46 science teachers and 3956 science students) in Australian universities. The results complete a chain of relations from teacher thinking to the outcomes of student learning. Previous studies have shown relations between teachers' conceptions of teaching and learning and their approaches to teaching. Numerous studies have shown correlations between students' deeper approaches to learning and higher quality learning outcomes. The results reported here link these two sets of studies. They also highlight the importance, in attempts to improve the quality of student learning, of discouraging teacher-focused transmission teaching and encouraging higher quality, conceptual change/student-focused approaches to teaching.

Introduction

This paper reports the results of a quantitative study aimed at investigating the relations between a teacher's approach to teaching and the approaches to learning of the students in the class of that teacher. The study builds on the substantial body of qualitative research which has characterised students' qualitatively different approaches to learning and the more recent qualitative research on variation in teachers' approaches to teaching. It reveals links between the ways teachers approach teaching, and the ways their students approach learning.

Studies in the seventies on approaches to student learning (Marton and Säljö 1976; Biggs 1978; Entwistle and Ramsden 1983) reported the differences between deep approaches and surface approaches to learning. Studies then and since have consistently shown that deeper approaches to learning

are related to higher quality learning outcomes (Marton and Säljö 1997; van Rossum and Schenk 1984; Trigwell and Prosser 1991; Ramsden 1992; Prosser and Millar 1989).

Related studies also suggest that students' awareness of their learning environment is related to the approach to learning they adopt. That is, approaches to learning are relational. Ramsden (1992) reports on studies of the relations between students' perceptions of their learning environment and their approach to learning. They show that students who perceive the nature of the assessment as encouraging memorisation and recall, and who perceive the workload demands of a subject as high, are more likely to adopt a surface approach. A deep approach is found to be associated with perceptions of high quality teaching, some independence in choosing what is to be learned, and a clear awareness of the goals and standards required in the subject (Trigwell and Prosser 1991; Prosser and Trigwell 1998).

Studies relating high quality teaching to student learning outcomes have, to date, been based on students' perceptions of the quality of teaching. There have been no reports of relations between teachers' reports of their approaches to teaching and their students approaches to learning or learning outcome.

In a phenomenographic study Trigwell, Prosser and Taylor (1994) identified five qualitatively different approaches to teaching as follows:

Approach A: A teacher-focused strategy with the intention of transmitting information to students;

Approach B: A teacher-focused strategy with the intention that students acquire the concepts of the discipline;

Approach C: A teacher/student interaction strategy with the intention that students acquire the concepts of the discipline;

Approach D: A student-focused strategy aimed at students developing their conceptions;

Approach E: A student-focused strategy aimed at students changing their conceptions.

Approach E, a conceptual change/student-focused approach is one which has the student as the focus of activities. To the teacher adopting this approach it matters more what the student is doing and learning than what the teacher is doing or covering. The teacher is one who encourages self directed learning, who makes time (in formal "teaching" time) for students to interact and to discuss the problems they encounter, who assesses to reveal conceptual change (not only to judge and rank students), who provokes debate (and raises and addresses the taken-for-granted issues), who uses a lot of time to question students' ideas, and to develop a "conversation" with students in

lectures. Approach A, an information transmission/teacher-focused approach is one where the transmission is focused on facts and skills, but not on the relationships between them. It is assumed that students do not need to be active in the teaching-learning process. The teacher adopting this approach has their focus on what they do in their teaching, they believe students have little or no prior knowledge of the subject they are teaching, and they do little more than transmit to enable the students to have a good set of notes.

Using the results of the qualitative study referred to above, we have developed an Approaches to Teaching Inventory (Trigwell and Prosser 1996a; Prosser and Trigwell 1998) which includes as items the characteristics described in Approaches A and E in the previous paragraph. Sample items from the inventory are given in the Methods section below.

In the same study we explored the conceptions of teaching and learning of science lecturers (Prosser, Trigwell and Taylor 1994). Conceptions of teaching ranged from teaching as transmitting concepts of the syllabus to teaching as helping students change conceptions. The same staff described a range of conceptions of learning from learning as accumulating more information to satisfy external demands, to learning as conceptual change to satisfy internal demands. As with approaches to learning these conceptions were constituted as hierarchies, where the more complete conceptions include the more limiting conceptions, but not vice versa.

The approach adopted by teachers has been shown to be related to their conceptions of teaching (Trigwell and Prosser 1996b) and also to their perceptions of their teaching context (Prosser and Trigwell 1997). Those teachers who conceive of learning as information accumulation to meet external demands also conceive of teaching as transmitting information to students, and approach their teaching in terms of teacher-focused strategies. On the other hand, those teachers who conceive of learning as developing and changing students' conceptions, conceive of teaching in terms of helping students to develop and change their conceptions and approach their teaching in a student-focused way (Prosser and Trigwell 1998).

The relations between the results of the studies described above are summarised in Figure 1.

This project was aimed at investigating the missing link in the diagram: between teachers' approach to teaching and students' approach to learning. More specifically it was to explore quantitatively, the extent to which an information transmission/teacher-focused approach to teaching is associated with a surface approach to learning, and a conceptual change/student-focused approach to teaching is associated with a deep approach to learning.

Two recently reported qualitative studies identify some relations between teacher teaching and student learning. Patrick (1992) distinguished three

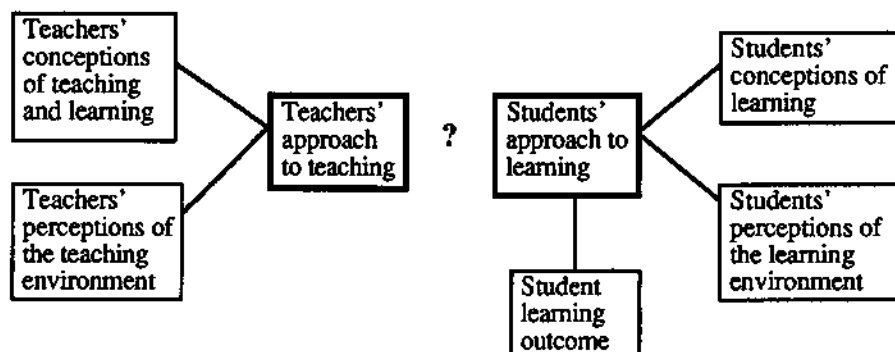


Figure 1. Established links between teachers' conceptions of teaching and learning and students' learning outcomes.

broad groups of secondary school history teachers when she focused on how they speak of, and teach their subject. The first group focused on content, on presentation and on technique, while seeing the students relation to the subject matter as being unproblematic. This approach is very similar to the information transmission/teacher-focused approach described above. The second group of teachers saw their role as helping students to "see the structure of", "recognise", "understand" and "see points of view in" the history they were studying. They saw the learning of history as problematic, hence their need to be involved, but saw the way in which students might learn it as unproblematic just as historical knowledge was unproblematic. The third group of history teachers did see historical knowledge as problematic and their focus was on the way the material was approached by students, the way they were relating aspects to one another and the questions they were asking and discussing. The teachers attempted to get the students to "think", "change", "connect", and "grow". This approach is similar to the conceptual change/student-focused approach described above.

In commenting on this study, Marton and Booth (1997) describe how the approach adopted by students in the classes of these teachers is consistent with the approaches to teaching adopted by the teachers.

When asked in an experimental situation at the end of the two years covered by the study to read an historical passage, and when asked about the arguments and the content it contained, there was a remarkable match between the ways in which the teachers and their students faced it when viewed as an historian's account of some piece of history – whether they saw it as unproblematic or as argumentation with respect to culture, perspective, argument and the role of the historian. (Marton and Booth, p. 177)

In a similar study of how higher education teachers conceive of and constitute what it is that students will be asked to learn, Martin and Ramsden (1998) report relations between how the teachers describe their approach, and how students respond to that approach. From their sample of six teachers they report four qualitatively different ways in which the students' object of study in creative writing was constituted by the teachers. In three case studies they link teachers' approach with students' responses. The approach of one teacher was on asking students to read, and the focus of the teaching was on the established literature. There was no reference to the way writing made readers feel and students of this teacher reported an approach based on the literary and analytical nature of the subject. A second teacher focused on the skills and the craft of writing and required students to write to achieve these outcomes. Students' responses indicated that the focus of their approach was on the skills and craft of writing. The third teacher focused her teaching on what the writer might have to say, and carried out that teaching by requiring students to reflect on what they have to say. Students of this teacher describe how they learned to think as well as to write in these classes.

As in Patrick's study, there is a match between the approach taken by the teacher and the approach adopted by students. However, the extent to which the student response reported in these studies reflect the response of the whole group, or even the majority of students, is not known.

In quantitative studies, Kember and Gow (Gow and Kember 1993; Kember and Gow 1994) report finding a correlation between teachers' conceptions of/orientations to teaching and students' approaches to learning at the departmental level. In departments with a greater propensity towards learning facilitation, students were more likely to be adopting a deep approach. This study suggests a connection between teaching and learning at the departmental level and does include high proportions of students. However, the results could be related to disciplinary differences, so it does not allow us to say anything about the relations between approaches adopted by an individual teacher and her/his students.

We are unaware of other related quantitative studies conducted from the perspective adopted in this paper. The following questions raised in the qualitative studies remain. Is it the case that one approach to teaching by an individual teacher is associated more with one or other approach to learning among the majority of his or her students? If so, given the preference among teachers for students to adopt deep approaches, is the teaching approach related to deep approaches to learning also the preferred approach to teaching? To explore these questions we surveyed the students and the lecturer in each of 48 first year science classes.

Method

Data were collected from 48 first year University chemistry and physics classes, comprising a total of 3956 students and 46 teachers. The smallest class consisted of 33 students and the largest class had 243 students. Two teachers taught two classes each.

The teachers completed the Approaches to Teaching Inventory (Trigwell and Prosser 1996a; Prosser and Trigwell 1998) and the students completed a version of the Study Process Questionnaire (Biggs 1987) which had been modified to suit the specific context of the study. Both teachers and students were asked to complete the questionnaires in relation to the particular lecture topic being taught to the students.

The Approaches to Teaching Inventory contains two scales, representing two fundamentally different approaches to teaching identified in a phenomenographic study of university science teachers approaches to teaching (Trigwell, Prosser and Taylor 1994). The two scales are:

Information Transmission/Teacher-Focused Approach

This approach is one in which the teacher adopts a teacher-focused strategy, with the intention of transmitting to the students information about the discipline. In this transmission, the focus is on facts and skills, but not on the relationships between them. The prior knowledge of students is not considered to be important and it is assumed that students do not need to be active in the teaching-learning process. (Trigwell and Prosser 1996a, p. 80)

Conceptual Change/Student-Focused Approach

This approach is one in which teachers adopt a student-focused strategy to help their students change their world views or conceptions of the phenomena they are studying. Students are seen to have to construct their own knowledge, and so the teacher has to focus on what the students are doing in the teaching-learning situation. A student-focused strategy is assumed to be necessary because it is the students who have to re-construct their knowledge to produce a new world view or conception. The teacher understands that he/she cannot transmit a new world view or conception to the students. (Trigwell and Prosser 1996a, p. 80)

The two scales contain two sub-scales – intention and strategy sub-scales. An intention and strategy item from each scale, the number of items in each scale, and the associated Cronbach alpha reliabilities, are shown in Table 1.

Table 1. Examples of items from the Approaches to Teaching Inventory

<i>Information Transmission/Teacher-Focused (ITTF) approach (8 items, $\alpha = 0.67$)</i>	
Intention item:	I feel it is important to present a lot of facts in the classes so that students know what they have to learn for this subject
Strategy item:	I design my teaching in this subject with the assumption that most of the students have very little useful knowledge of the topics to be covered.
 <i>Conceptual Change/Student-Focused (CCSF) approach (8 items, $\alpha = 0.68$)</i>	
Intention item:	I feel a lot of teaching time in this subject should be used to question students' ideas
Strategy item:	We take time out in classes so that students can discuss among themselves the difficulties that they encounter studying this subject.

The Study Process Questionnaire (SPQ) used contains two scales: a Deep Approach to Learning scale, and a Surface Approach to Learning scale, each with intention and strategy sub-scales. The items were modified to reflect the particular context of this study – first year university science teaching. So, for example, an item that read “In reading new material I find that I’m continually reminded of material I already know and see the latter in a new light (Item 11)” in the original SPQ, was changed for this study to read “In reading new material for this topic I find that I’m continually reminded of material I already know, and see the latter in a new light (Item 8)” in order to focus the respondents’ attention on the subject/topic to which this study referred.

The analysis was conducted in two phases, using the class as the unit of analysis:

- A principal components factor analysis, followed by varimax rotation to look at the structural relationship between combinations of variables;
- A cluster analysis, followed by between group contrasts among resultant clusters to look at subgroups of teachers and students.

Factor analysis looks at the relations between variables and groups of variables. Cluster analysis, on the other hand, looks at clusters of related units of analysis (in this case, classes). So while factor analyses allow us to focus on how individual variables are related to one another, cluster analyses allow us to focus on individual classes and how they are clustered.

Table 2. Principal components factor analysis of the teacher's approach to teaching and students' approach to learning variables

Approach variables	Factors	
	1	2
Students' Deep Approach to Learning (class mean)	-76	
Students' Surface Approach to Learning (class mean)	69	-38
Teacher's CCSF Approach to Teaching		97
Teacher's ITTF Approach to Teaching	66	

n = 48, decimal points removed, loadings between -0.30 and 0.30 deleted

CCSF Conceptual Change/Student-Focused

ITTF Information Transmission/Teacher-Focused

The principal components explained 64% of the variance

Results

The results of principal components factor and cluster analyses both show relations between teachers' approaches to teaching and students' approaches to learning.

Principal components factor analysis

A principal components factor analysis, followed by varimax rotation, was conducted to look at the structural relationships between variables. It should be noted that while the case to variable ratio is not large (12:1) it substantially exceeds the suggested minimum for such analyses (Tabachnick and Fidell 1989). The analysis identified one factor with an eigen-value greater than one (eigen-value = 1.59) and another with an eigen-value very close to one (eigen-value = 0.98). A scree analysis suggests one or two factors. Table 2 shows the results for two factors.

Factor 1, explaining 39.7% of the variance, shows substantial loadings on three of the four variables. It shows a substantial negative loading on Students' Deep Approach to Learning variable and substantial positive loading on Students' Surface Approach to Learning variable and Teachers' Information Transmission/Teacher-Focused Approach to Teaching variable. This suggests that an information transmission/teacher-focused approach to teaching is linked to a surface and non-deep approach to learning at the class level. Factor 2, explaining 24.4% of the variance, shows substantial loadings on two of the variables. It shows a negative loading on the Students' Surface Approach to Learning variable and a substantial positive loading on the Teachers' Conceptual Change/Student-Focused Approach to Teaching variable. This factor suggests that a conceptual change/student-focused approach to teaching is linked to a non-surface approach to learning.

Table 3. Summary for the Approaches to Learning and Approaches to Teaching variables by cluster membership (n = 48)

Approach variables	Cluster 1 (n = 19)		Cluster 2 (n = 29)	
	Mean	SD	Mean	SD
Students' Deep Approach to Learning (class mean)	-0.57	0.99	0.38	0.38
Students' Surface Approach to Learning (class mean)	0.59	0.85	-0.39	0.92
Teacher's CCSF Approach to Teaching	-0.24	1.09	0.16	0.92
Teacher's ITTF Approach to Teaching	0.72	0.64	-0.47	0.91

Hierarchical cluster analysis using Ward's method

Contrasts between standardised means for all variables, except the CCSF Approach to Teaching, statistically different at the $p < 0.001$.

Cluster analysis

As a means of analysing how, at the class level, individual teachers approach their teaching and how their students approach their learning a cluster analysis was conducted aimed at identifying subgroups of classes with similar approaches to teaching and approaches to learning. Standardised scores on the four variables were used in a hierarchical cluster analysis using Ward's minimum variance method to identify an appropriate number of clusters (based upon the increasing value of the Squared Euclidean Distance between clusters). The analysis indicated that the two cluster solution was the most acceptable. Table 3 shows the results of a between groups contrast analysis for each cluster.

The analysis identified statistically significant contrasts on all variables, with the exception of the Teacher's Conceptual Change/Student-Focused Approach to Teaching variable. The first cluster includes 19 classes in which the teachers report adopting more of an information transmission/teacher-focused approach to teaching and the students in those classes report adopting more of surface and non-deep approaches to learning. The second cluster includes 29 classes in which the teachers report adopting more of a non-information transmission/teacher-focused approach to teaching and the students report adopting more of a deep and non-surface approaches to learning. While the conceptual change/student-focused contrast between the clusters was not statistically significant, it was in the direction consistent with the other three variables.

In summary, it seems that, based on the principal components factor analysis, an information transmission/teacher-focused approach to teaching is strongly associated with surface and non-deep approaches to learning and that a conceptual change/student-focused approach to teaching is asso-

ciated, but less strongly, with a non-surface approach to learning. If we turn away from looking at the associations between variables, and focus on individual classes, the cluster analysis suggests that in those classes in which teachers report adopting more of an information transmission/teacher-focused approach to teaching, their students report adopting more surface and non-deep approaches to learning. In contrast in those classes in which teachers report adopting less of an information transmission/teacher-focused approach to teaching their students report adopting more of a deep and non-surface approach to learning.

Discussion and conclusion

This study is the first study of its type to investigate the *teachers'* reports of their approach to teaching rather than the students' perceptions of their teacher's teaching, and to show relations between teacher's approaches to teaching and students' approaches to learning. The teachers who describe their teaching as an information transmission/teacher-focused approach are more likely to be teaching students who report adopting a surface approach in that class. What adds to the significance of this result is the association between this result and the studies of student learning which, over many years, have consistently shown that surface approaches to learning are related to lower quality learning outcomes (Marton and Säljö 1976; van Rossum and Schenk 1984; Trigwell and Prosser 1991; Ramsden 1992; Prosser and Millar 1989). Now, it would appear that there is a relation between approach to teaching and the quality of student learning outcomes. There are several implications resulting from this observation.

First, extensive research studies have been conducted into students' perceptions of the learning environment factors associated with approaches to learning (and learning outcome) (Entwistle and Ramsden 1983; Ramsden 1992). As noted earlier, students' perceptions that they are experiencing "good teaching" is one of the factors found by Ramsden and others to consistently correlate with a deep approach to learning. In those studies good teaching is defined as teaching that involves giving helpful feedback, making an effort to understand the difficulties students may be having, being good at explanations, making subjects interesting, getting the best out of students, motivating students and showing an interest in what the students have to say (Ramsden 1992). Students who describe an experience of good teaching are also likely to be students who report adopting a deep approach (Trigwell and Prosser 1991). The results reported here from the teacher's perspectives support these previous studies which use evidence collected from the students' perspective. When teachers, for example, report that their focus is

on what they do in their teaching, when they believe students have little or no prior knowledge of the subject they are teaching, when they do little more than transmit facts so that students will have a good set of notes, their students are more likely to adopt a surface approach to learning. Conversely, when teachers report that they have the student as the focus of their activities, where it matters more to them what the student is doing and learning than what the teacher is doing or covering, where the teacher is one who encourages self directed learning, who makes time (in formal "teaching" time) for students to interact and to discuss the problems they encounter, where the teacher assesses to reveal conceptual change, where the teacher provokes debate, uses a lot of time to question students' ideas and to develop a "conversation" with students in lectures, then their students are less likely to be adopting a surface approach.

Second, the links described here between teaching and learning assist in the development of programs to improve student learning. Previous research which indicates relations between student perceptions of the learning environment and approaches to learning was a source of information in attempts to improve learning. By focusing on improving those aspects of the learning environment described by students to be related to their approaches to learning, it is possible to improve the quality of learning. The results from this study highlight the importance in these attempts (to improve the quality of student learning) of working with academic staff to encourage adoption of higher quality approaches to teaching. We have previously noted that in order to change the way teachers approach their teaching (to focus more on their students rather than their own performance) there may also be a need to change the way they conceive of teaching and learning (Trigwell 1995; Trigwell and Prosser 1996b). As described in the introduction, those teachers who conceive of learning as information accumulation to meet external demands also conceive of teaching as transmitting information to students, and approach their teaching in terms of teacher-focused strategies. On the other hand, those teachers who conceive of learning as developing and changing students' conceptions, conceive of teaching in terms of helping students to develop and change their conceptions and approach their teaching in a student-focused way. The research reported in this paper completes a chain of relations between teacher thinking and student learning outcomes by describing the missing link between approaches to teaching and approaches to learning (Figure 1).

And third, the results of the study contribute to the debate on what constitutes good university teaching and how it can be improved. Major advances have been made in recognising and rewarding good teaching in Universities in the last ten years. The conclusions in the literature on this work (reviewed

by Ramsden et al. 1995) are supported and extended by the results reported here. A conceptual change/student-focused approach to teaching is a part of good teaching as that approach is more likely to be associated with higher quality learning outcomes.

We have made no mention of causality or the direction of causality in describing the relations observed in this study. The study was not constructed to yield such information and in any event, the issue of causality is problematic. For example, the context established by a teacher using a student-focused approach may influence students to adopt a deep approach, but it is equally likely, as we have observed, that some tutors adapt their approach to teaching in respond to the requests of students to, for example, go through problems in a transmission/teacher-focused manner.

While these results are the first to relate approaches to teaching to approaches to learning in higher education, they need to be interpreted with some caution. The sample size was not large, and only one field of study (physical science) was included. One of the inventories used in the study is still in the early stage of development, and can be expected to be substantially improved with further development. However, coherent and interpretable relationships have been identified. The analysis results, if not statistically significant, are in a direction consistent with the statistically significant relations. Our continuing studies in this area will have increased sample sizes, an expanded range of fields of study, as well as more refined instruments, all of which might be expected to increase the effect size of the relations observed. In using Figure 1 as an organising framework for this study, we have also identified a new area of research which is the focus of our current activities. The outcomes for the student from their approaches to learning (student learning outcomes) have been studied extensively. However, we have found no research reporting on the outcomes for teachers from their approaches to teaching.

In conclusion we wish to re-emphasise the major outcomes of the study, that is that teachers who themselves report adopting more of an information transmission/teacher-focused approach to teaching have students who themselves report adopting a more surface approach to learning. Without a result such as this, much of the previous research from the student learning perspective on teaching and learning in higher education would be for nought.

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