TEACHER EDUCATION STUDENTS’ KNOWLEDGE ABOUT HOW CLASS DISCUSSIONS HELP THEM TO LEARN

Michael J. Lawson
School of Education
Flinders University

Helen Askell-Williams
Centre for Lifelong Learning
Flinders University

Rosalind Murray-Harvey
School of Education
Flinders University

RUNNING HEAD: Knowledge about class discussions

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Abstract

Self-regulatory perspectives of learning imply that students need to possess knowledge about 1) themselves as learners, 2) how to build effective knowledge structures, and 3) how to further develop and apply their knowledge. In a teacher education context we would hope that students would be able to explicitly articulate such knowledge, not only in relation to themselves as learners, but also as potential teachers of other learners. This paper describes a study that sought to investigate pre-service teachers' knowledge about learning. We asked final year teacher education students to provide a short written answer to the question, "What happens in your university classes that helps you to learn." The students' most frequent response was, "Discussions." We then conducted follow up interviews with some of these students in which they elaborated upon their written responses. We created a framework for analysing students' responses based upon principles of classroom climate, motivation, self-regulation and psychological- and social-constructivism. Finally, we developed a framework to examine the generative power of students’ statements about how class discussions helped their learning. We draw conclusions about 1) the value of discussions as a teaching and learning technique, 2) the quality of participants' knowledge about how discussions help them to learn, and 3) the implications of participants' knowledge about discussions for their future roles as teachers.

Key words:

Teacher education - general; Learning and assessment; Class discussion; Generative power
On the internet you will find that universities and schools have produced some fine statements about teaching and learning, saying such things as:

*The school is dedicated to learners knowing themselves profoundly as learners and thinkers.*

*The University expects its graduates to have the capacity for independent critical thought, rational inquiry and self-directed learning.*

*Teaching provides the opportunity for instructors to help their students make connections and form relationships across boundaries of classroom, discipline, skill, and background.*

*We intend to develop a community of learners who confidently and enthusiastically direct their learning.*

*In our [university] classes we will engage students as active participants in the learning process and will engage students in discussion of ways in which study tasks can be undertaken.*

Explicit in these statements is the expectation that our students will not only develop and use knowledge in a content knowledge domain, such as music or mathematics: They will also develop and use knowledge in another domain of knowledge, the domain of knowledge about learning.

The commitment, of course, is not just made by authors of mission statements. Contemporary descriptions of learning as a self-regulated activity (for example, Winne, 1995; Zimmerman, 1989) make clear that the development of knowledge is a shared responsibility, not only in the sense that students and teachers are active participants, but also in the sense that students will be knowledgeable participants. They will know how to carry out the learning tasks.

The substantial commitments made in the above statements are important for us as teachers and beg the question, “Do students know themselves as learners in such a ‘profound’ way?” This question is a focus of attention in this paper. We describe the knowledge that our students have about what helps them to learn. We then examine students’ knowledge about class discussions, which was the teaching-learning activity most frequently nominated as being helpful for their learning, and describe and apply a framework for estimating how ‘profound’ that knowledge might be.
We expect that our final year teacher-education students are, in part, undertaking study in order that they will be able to help their own students to develop knowledge about learning. Teacher education students need professional knowledge to be able to generate the designs for the teaching episodes that will enable them to facilitate their own students' learning (Munby, Russell, & Martin, 2001; Shulman, 1986). Within a teacher education program we might expect students to engage with ideas about learning developed within contemporary educational literature, such as

- A constructivist perspective on learning (Phillips, 2000).
- Teaching procedures, including those specific to a curriculum domain (Putnam & Borko, 1997; Tobin, Tippins, & Gallard, 1994).
- Influences of social context and culture external to a school (Moore, 2000).

Because these students have been involved practically in learning in schools and university for a long period we might also expect them to have developed knowledge about:

- The role of learning environments, of collaboration, of community, and of environments that encourage different approaches in students (Brown & Palinscar, 1989).
- The role of practical experience (Jones & Vesilind, 1996).

The mediating effect of students’ understandings on teaching actions has been a strong theme in instructional psychology for some time. This view was illustrated in early work by Winne and Marx (Winne, 1985; Winne, 1987; Winne & Marx, 1977; Winne & Marx, 1980) and also in writing such as those of Anderson (1981); Leinhardt & Putnam (1987); Peterson and Swing (1982) and Rohrkemper (1985). Rather than being a passive observer of people and events the learner was seen to be an active agent in his or her own learning, “continuously involved in cognition about self and environment” (Winne & Butler, 1994, p. 5738).

Students’ knowledge about learning

Previous research with teacher education students (for example, Lawson & Askell-Williams, 2001) has indicated that students do indeed identify many themes that are explicit in the bodies of literature just noted. When Lawson and Askell-Williams asked students “What helps me to learn in my university classes?” the most common responses referred to
learning activities such as discussions and group work. Other high frequency responses included active learning involvement, cognitive qualities of set readings, personal qualities of the tutor/lecturer, supportive learning environments, critical thinking opportunities and practical activities. Very few responses mentioned the affective or motivational state of learners that is a central focus in descriptions of learning as a self-regulated activity. The findings from a survey of Belgian educational science students carried out by Elen and Lowyck (1999) provided quite similar characterisations of good instruction: an interested, well-trained enthusiastic instructor; clear, focussed contented presented in interesting ways; good relationships between students and instructor in a supportive environment; and a well organised classroom. Many of the same qualities were described in Doyle’s (1986) discussion of classroom organisation and management.

What was not clear from the Lawson and Askell-Williams’ research is how well-developed was the students’ knowledge about these topics. Although students showed clear preferences for teaching approaches and situations that are valued highly in the educational research literature, it was not clear whether the students’ knowledge of these approaches and situations was at the level of mere familiarity with key terminology, or whether it was more elaborated, or had greater complexity. Concerns about the quality of teacher education students’ knowledge have been voiced in the United States by Woolfolk-Hoy and Tschannen-Moran (1999) and in the Belgian study of Elen and Lowyck (1999). Woolfolk-Hoy and Tschannen-Moran worried that

[prospective teachers] lack understanding of the connections between teaching strategies and students’ learning ... our students have great difficulty explaining the mechanism of learning and how teaching influences these processes ... Few students are able to connect the activity to cognitive processes that lead to learning, and few prospective teachers articulate what they want students to learn in ways that adequately represent academic content or cognitive outcomes (p. 280-281)

Furthermore, Elen and Lowyck found that their students lacked systematic vocabularies about instruction and did “not seem to have articulate conceptions about the way in which an instructional environment may support their cognitive processing and/or control activities” (p. 157).

Hence in Phase 1 of this study we set out to replicate the survey reported by Lawson and Askell-Williams (2001) with a cohort of final-year teacher education students. In the second phase of this study we interviewed a sample of students to probe their knowledge about one of the topics they regarded as most helpful for their own learning, so that we could examine
the degree of development of that knowledge. For this paper we have analysed the results of this probing of knowledge focusing on the topic of class discussions.

Class discussions

In a classroom other students form a key part of the instructional environment and an important influence on the process of individual knowledge construction is the learner’s involvement in social transactions, particularly discussions (Wortham, 2001). In this respect Palinscar (1998, p. 361) has noted that, “from a social-constructivist perspective, discourse is the primary symbolic, mediational tool for cognitive development.” The benefits of discussion have been emphasised for such areas as the understanding of subject matter (Dillon, 1994) critical thinking (Tsui, 2002), for maintaining motivation (especially interest) and for developing moral positions (e.g., Tobin, Tippins and Gallard, 1994).) Reviews of research in this area have been presented (see Cazden, 1986; Nuthall, 1997).

Distinctions have been drawn between discussions and other forms of verbal interaction such as conversations, show and tell, teacher led question-answer sessions, statements of intentions, or discourse about non-problematic (known) situations (for example, see Cusworth, 1995; Dillon, 1994; Larson, 2000; Pontecorvo, 1987; Splitter & Sharp, 1995; Sprod, 1997). We have adopted Pontecorvo’s (1987) definition that stresses both a collective approach and a problematical situation as being essential ingredients for a knowledge building discussion.

[A discussion is] ... that particular kind of conversation or verbal interaction in the classroom that is designed to solve a problem collectively that can be interpreted in many different ways; namely, to delimit a topic or define terminology; to clarify a conceptual field on which some work has already been done, to link up different experiences by comparing observations and interpretations, to work out a satisfactory explanation of a phenomenon, etc. (p. 240).

Early studies analysed features of students’ discussions. For example Resnick et al. (1993) conducted an analysis of conversations among triads of university students and identified various structural facets of discourse including premises, conclusions, challenges, responses to challenges and concessions. Pontecorvo (1987) investigated discussions in elementary classes and suggested that discussions allowed people to “think together” with an openness or “permeability” to each other’s thoughts. The effort of thinking is “shared out” and anxiety associated with producing an answer is reduced. Pontecorvo suggested that discussion is a “process” that can be translated into “progress” in a group’s thinking.
Pontecorvo and Giradet (1993) audiotaped discussions in small groups of fourth grade students about an historical problem. The researchers concluded that, “autonomous interactional activities can be extremely rich situations in terms of the production of high level reasoning, even in young children” (p. 391). Pontecorvo and Giradet likened their participants’ group discussions to situations of cognitive apprenticeship as discussed by Collins, Brown and Newman (1989). In Brown and Campione’s (1996) communities of learners, reciprocal teaching and jigsawing provided the participant structures that fostered student-student and student-teacher discourse. Such discourse underpins the dialogic base that Brown and Campione identified as one of a number of first principles of learning, and which “provide(s) the format for novices to adopt the discourse structure, goals, values and belief systems of scientific practice” (Brown & Campione, 1996, p. 267).

Recently, Nuthall and Alton-Lee’s (1997; 2000a; 2000b) “listening in” studies probed how discussion contributes to knowledge construction in classrooms:

If, for example, a student acquires knowledge of a concept by being told the relevant information by a teacher, the student’s understanding will incorporate the single dependent perspective of the student-teacher relationship. If, on the other hand, the student acquires the knowledge in the context of a classroom discussion in which different perspectives are described, explained and debated, the student’s representation of the schema will incorporate a larger network of intertwined social and logical relationships. (Nuthall, 1997, p. 743)

Of course, not all classrooms manifest high level ‘autonomous interactional activities’ and Baxter, Woodward and Olson (2001) have shown that class discussions might prove too demanding for low-achieving students, involving them infrequently and providing few opportunities for such students to speak. Hollander (2002) also noted that, although there is a consensus in the literature of higher education that class discussions are associated with growth in student learning, the organisation of effective discussions at the individual class level is not straightforward: Some students talk too much, some too little; the content of discussions can be problematic and there is no guarantee that this content will be threaded in a coherent manner; and not all students may have developed effective skills for participation. Recognition of the problematic nature of discussion from the teacher’s perspective raises the possibility that discussions might also be seen as problematic by students. Even if discussion is not problematic for students it could be that their knowledge is not sufficiently well developed to enable them to make effective use of a discussion. It was concern with this latter
topic that stimulated us to consider the quality of students’ knowledge about class discussions.

Generative power

Researchers have addressed issues of quality of knowledge from different perspectives and using different terminology (e.g., depth of processing; levels of outcomes; connectedness; complexity, elaboration). Problems have been associated with each of the terms favoured within those different perspectives. For example, Jacoby and Craik (1979) pointed out that the proposition that more deep and meaningful analyses led to better memory was troubled by the fact that “some difficulty has been encountered in specifying exactly what is meant by ‘deep’ and ‘meaningful’” (Jacoby & Craik, 1979 p. 1). Twenty years later the same problem was raised in Mintzes and Novak’s (1999) analysis of ‘understanding’.

The varied perspectives on knowledge quality have arisen as researchers have focussed on different dimensions of quality. When Biggs and Collis (1982) addressed the question of identifying quality in students’ learning outcomes their SOLO taxonomy included dimensions such as capacity of memory, relatedness of constructs, and conceptual abstraction and extension beyond the instructional material given. White and Gunstone (White, 1979; White & Gunstone, 1980) took an even more multi-dimensional perspective on the qualities of cognitive (memory) structure. White’s (1979) initial dimensions were 1) extent, 2) precision, 3) internal consistency, 4) accord with reality, 5) variety of types of memory element, 6) variety of topics, 7) shape, 8) ratio of internal to external associations, and 9) availability.

Other researchers have focussed upon a dimension of knowledge relatedness, or connectedness, when addressing knowledge quality (for example, Anderson, 2000; Mayer, 1975; Nuthall, 2000a; White & Gunstone, 1992). More recently Hogan and her colleagues (Hogan, 1999a; Hogan, 1999b; Hogan & Fisherkeller, 1999; Hogan, Nastasi, & Pressley, 2000) produced a series of papers that documented eighth grade students’ depth of cognitive processing and reasoning complexity. To assess students’ reasoning complexity Hogan et al. created a rubric containing six criteria: generativity, elaboration, justifications, explanations, synthesis and logical coherence.

In this project we had a similar concern to that of Hogan because we wanted to both describe what students could say about discussions and to examine how well-developed or ‘profound’ were their views about how class discussions facilitated their learning. Our choice of descriptor for the index of development was influenced by the situation of our teacher education students. We expect final year teacher education students to be able to teach their
own students about learning, including about learning in class discussions. In other words, we expect these students to be able to use their knowledge of learning to generate teaching actions that will facilitate their own students learning, and also to lead discussions about such learning. The label ‘generative power’ is used to reflect these expectations and the objective for our analysis of the interview data on class discussion in Phase 2 of this study was to differentiate between statements on the basis of their generative power.

The idea that a knowledge base would be able to generate applications has been advanced by other writers. Mayer (1975) proposed that knowledge structures could be characterised differentially in terms of their internal and external connectedness. The better the quality of connectedness the more useful was the knowledge representation expected to be in problem solving. Mayer (2003) has continued use of the notion in his recent discussion of ‘generative activities’ that help the learner to integrate newly presented information with existing knowledge. Wittrock (1989) described comprehension as a generative activity involving the “active construction of relations” (p. 349). Also of relevance in the current context is Wittrock’s description of generative teaching as “knowing how and when to facilitate the learner’s construction of relations” (p. 353). In Wittrock’s analysis the teacher needs to have access to strategies that will mediate such facilitation of student generative processing.

We have used power in the sense that Bruner (1966) used that term. For Bruner a more powerful form of representation was one that enabled a learner to generate solutions to a wider range of problems, so that a powerful knowledge representation would allow “a learner, to connect matters, that on the surface, seem quite separate”(p. 48). Use of the term generative power provides a way to establish a qualitative dimension to the facilitative actions described by Wittrock and Mayer and represents the way of describing an important set of expectations we hold for our teacher education students.

We set three objectives for this paper:

1. To report on student teachers’ perceptions of procedures that facilitate their learning in university classes.

2. To describe the range of ways in which student teachers regard class discussions as facilitating their learning.

3. To apply a coding system designed to provide information about the generative power of students’ knowledge about how class discussions help them to learn.

**Method**
Participants

Seventy-eight students in the final semester of their final year of the junior primary, primary, middle school and secondary strands of the Bachelor of Education (B Ed) program in an Australian university, participated in this study. Students had undertaken at least 80 days of supervised practical teaching experience in schools. Participants comprised a mix of mature age students and those aged in their early 20s. Students were mostly female and predominantly of Anglo-Saxon background.

Procedure

In Phase 1 of the study participants provided written responses to the probe question, “What happens in my university class that helps me to learn?” These responses were tabulated and sorted into categories. Two researchers worked on the categorising procedure independently and then compared categories. We discussed and resolved disagreements by consensus and accounted for all statements in 49 discreet categories. Class discussions emerged as the most frequently cited category, accounting for 81 of the total of 365 statements.

At the same time as we gathered written responses, we asked participants to volunteer to attend an interview to discuss their written responses in more detail in Phase 2. We offered a payment for the time spent in the interview. Forty students volunteered to be interviewed, of whom 20 could attend at times available for interview. Interviews about learning were held with 10 students. The remaining students were interviewed about application of their nominated procedures to teaching. The current report focuses on the first set of interviews about learning.

The interview began with the student’s written response to the probe question. The student was asked to:

- Look over the statements you made on the card (during Phase 1) and select the statement that you think is most important in terms of helping you to learn in your university classes.
- Pick the statement that refers to the procedure/strategy/thing that you think is most important for helping you to learn in university classes.

The student was asked questions about the chosen statement that probed their understanding of how this subject of that statement helped them to learn. The interviewer asked the student to expand on the meaning of the statement, to give an example, to explain how it helped his/her learning, what part of the learning process was affected by it, and how this effect occurred. Students were invited to use any form of explanation they thought helpful.
and were encouraged to express their theories of how learning was affected. They could, and did, draw diagrams and discussed their theories of learning.

A key component of the interview procedure was the sequential probing of terms used in explanations. Thus if a student explained that class discussion helped her to “bounce ideas off others” she was asked to explain what ‘bouncing off’ involved and how that helped her learning. Subsequent questions sought explanations for any new ideas introduced in an explanation. The purpose of this method of probing was to gradually extend the students’ analysis by seeking information about the key concepts involved in the series of explanations they offered. In terms of the notion of connectedness discussed above, the probes were designed to follow through the connections related to class discussion that had been established by the student. The probing ended when the student could generate no new information or indicated that there was nothing more to add. Each interview ran for approximately an hour. Interviews were transcribed verbatim.

It is relevant to note that use of this interview procedure meant that we did not always cover the same topics with each student. Class discussion was mentioned by each student, though one student made only a very brief mention of discussions and her data was not regarded as providing a good estimate of her understanding about class discussion. Interview data was therefore available for nine students.

**Coding of data**

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All three researchers read and discussed the sections of the interview transcripts concerned with class discussion on several occasions to identify the set of topics associated with discussions. Differences in identification of topics were discussed and coding undertaken again until a final set of topics was agreed upon.

To take our analysis of the class discussion sections of transcripts further, each transcript was segmented into statements. The statements in the transcript were treated as propositions expressed by participants about ways that class discussions had a facilitating effect on learning. One statement could be elaborated upon prior to expression of a different proposition about the effect of discussion on learning. Each of statements was coded according to the
scheme outline in Table 1. Repetitions of previous statements were not coded. The coding of propositions was undertaken independently by two of the researchers. Results of this independent coding were then discussed and disagreements resolved before a final independent coding of a different transcript was undertaken. This showed agreement on coding of 86% of statements. All transcripts were then coded by one of the researchers.

The levels identified in Table 1 are intended to represent the extent to which a student has developed a connected structure of knowledge related to how class discussion affects learning. The levels move from mere statement of an effect, to further description of that effect, to recognition of an implication of the effect for an affective or cognitive component of learning, to a more abstract level where the effect is explained with reference to a model or construct that can be related to a component of contemporary theory of learning. Level 4 statements are argued to have the greatest potential to, in Wittrock’s (1989) terms, generate further “constructions of relations” that will result in a more powerful knowledge construction associated with the topic of the discussion. As noted earlier these Level 4 statements are also argued to have the greatest potential for a teacher to help students to construct their sets of relations.

Results

Written responses about what facilitates learning

The frequencies of the statement categories made by the large group of students in answer to the question ‘What facilitates learning in my university classes?’ are shown in Table 2. Participants referred to many of the issues raised in the introduction to this paper as being of contemporary interest in literature on learning and teaching. For example, participants suggested that the features of the class atmosphere, learning resources (e.g., visual aids, readings, handouts), the personal qualities of teachers (e.g., teachers, humour), the procedures used in teaching (e.g., hands-on, practical activities, demonstration lessons), and the characteristics of the teaching presentations (e.g., clarity, relevance, topic integration) all facilitated learning. Participants also referred to their own personal qualities as students (e.g., time management, self-direction), habits of mind (e.g., personal reflection), and motivation, though these nominations were less frequent than the previous teacher-based set. As noted earlier, the most frequent nomination for facilitating learning was discussions. Sixty-nine of
<table>
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<tr>
<th>Level</th>
<th>Definition</th>
<th>Example</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>A proposition about an effect of class discussion is stated.</td>
<td>It's good to hear other people’s views.</td>
<td>The proposition is stated</td>
</tr>
<tr>
<td>2</td>
<td>The proposition about the effect of class discussion is elaborated without specification of further implications for learning.</td>
<td>by bouncing ideas off each other…well you pick up things that you didn’t really sort of think of.</td>
<td>This indicates that a component of learning, acquisition, will be affected.</td>
</tr>
<tr>
<td>3</td>
<td>These statements identify an implication of CD for a cognitive or affective state of the learner.</td>
<td>Um…because it helps me know what I’ve taken on board and what I can understand…the fact that I’ve disagreed with somebody means that I do have something there</td>
<td>An implication of the effect of class discussion on acquisition is identified.</td>
</tr>
<tr>
<td>4</td>
<td>The effect on some component of learning is explained, or the effect on a specific learning action is explained, or an explicit link with theory of learning is made, even if that theory is stated in everyday terms.</td>
<td>When a piece of information is presented…I have a network or a filter or a structure of thought and I take that piece of information and place it in a mental process…I make sort of connections.</td>
<td>This provides an account of how the effect on learning could occur. This statement also provides a link to a contemporary account of knowledge construction.</td>
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the 78 participants referred explicitly to class discussions and/or group work in their written responses. Of the remaining nine participants, four made implicit reference with words such as “interactive” and “social interaction.” Only five participants made no reference to discussions or group work.

Topics associated with class discussions

Each of the 10 interviewees nominated class discussions and working in groups as being helpful to their learning, although one spoke only briefly about class discussions and her response was not included in this analysis. Although negative thoughts about discussions and group work were few, it is important that they are not overlooked.

_I don’t actually like group work very much. I feel I need to perform for the group, as often group members do not contribute very intelligently._

One interviewee spoke about negative aspects of class discussion as they related to the assessment requirements of the course. She felt that; 1) class discussions and group work could cause a compromise solution that might achieve a lower grade than she could achieve on her own; 2) by sharing her ideas other people might steal them for their own gain, and; 3) people strayed off the discussion topic and wasted time. However, it is interesting to note that this participant told us that even if she did not contribute to those discussions she still used her written notes about issues raised during class discussions to assist her thinking and writing. She also said that she enjoyed partaking in a group brainstorm activity when there were no assessment constraints.

Negative statements were far outweighed by statements expressing the value of class discussions, such as the following:

_I take the information that the lecture has verbally presented. I think about this information and further my readings. [There is the] ability to take this information and clarify it through discussion. This clarification process is generally more helpful if done with my peers. Here each concept is redefined in a number of ways, from many different perspectives. This allows me every chance to identify with the type of communication the information is given in. I am never really sure what comment will trigger off my understanding._

Nine of the 10 interviewees spoke favourably about the beneficial aspects of discussions for their own learning. Indeed, four of the 10 interviewees said that class discussion was the
<table>
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<th>Category</th>
<th>Frequency</th>
<th>Category</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>Discussions</td>
<td>81</td>
<td>Lectures</td>
<td>4</td>
</tr>
<tr>
<td>Teachers</td>
<td>26</td>
<td>My point of view</td>
<td>4</td>
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<td>Assignments</td>
<td>16</td>
<td>Real life</td>
<td>4</td>
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<td>Visual aids</td>
<td>16</td>
<td>Attendance</td>
<td>3</td>
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<tr>
<td>Clarity</td>
<td>15</td>
<td>Facts</td>
<td>3</td>
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<tr>
<td>Readings</td>
<td>15</td>
<td>Feedback</td>
<td>3</td>
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<tr>
<td>Hands-on</td>
<td>14</td>
<td>Prior knowledge</td>
<td>3</td>
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<tr>
<td>Practical applications</td>
<td>13</td>
<td>Practicum</td>
<td>3</td>
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<tr>
<td>Personal reflection</td>
<td>10</td>
<td>Self direction</td>
<td>3</td>
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<tr>
<td>Relevance</td>
<td>10</td>
<td>Ideas</td>
<td>2</td>
</tr>
<tr>
<td>Active involvement</td>
<td>9</td>
<td>Individual</td>
<td>2</td>
</tr>
<tr>
<td>Groups</td>
<td>9</td>
<td>Negative examples</td>
<td>2</td>
</tr>
<tr>
<td>Interest</td>
<td>9</td>
<td>Problem solving</td>
<td>2</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>8</td>
<td>Social interaction</td>
<td>2</td>
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<tr>
<td>Demonstration lessons</td>
<td>8</td>
<td>Freedom</td>
<td>1</td>
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<td>Topic integration</td>
<td>7</td>
<td>Flexibility</td>
<td>1</td>
</tr>
<tr>
<td>Humour</td>
<td>7</td>
<td>Field trips</td>
<td>1</td>
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<td>Questioning</td>
<td>7</td>
<td>Listening</td>
<td>1</td>
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<td>Time management</td>
<td>7</td>
<td>Learning partnerships</td>
<td>1</td>
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<tr>
<td>Communication with tutor</td>
<td>6</td>
<td>Note taking</td>
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<td>Examples</td>
<td>6</td>
<td>Own way</td>
<td>1</td>
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<td>Handouts</td>
<td>5</td>
<td>Revision</td>
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<td>Role plays</td>
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<td>Scaffolded learning</td>
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<td>Workshops</td>
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most important feature that helped them to learn, and a further four said that class discussion was the second most important procedure facilitating their learning. The range of topics raised about class discussions during interviews is shown in Table 3. This range of issues is quite wide and many are described in ways that are close to descriptions available in contemporary literature on learning. For example, the advantage of interaction with peers for ‘picking up’ new ideas was identified by most of the students. Similarly, in the group of themes clustered under Learning Process: Examine are a number of statements that focus on a process of reflection on the current state of knowledge. Discussion could help with further exploration or with development of an argument, or with clarification. Reorganisation of ideas and expansion of knowledge on a topic were also identified as cognitive benefits. There were also a group of statements indicating that, collectively, these students recognise the role of affective and motivational elements in facilitation of learning in a class discussion. Four students emphasised the importance of their feeling comfortable with the group and with having certain types of students in their groups.

Among the student descriptions there were some well-developed models of knowledge structure, as indicated in the following description by one student of the effect of the introduction of new material during a discussion

...if it can connect somehow to what I’m thinking then I’ll connect it. If it doesn’t, well then...I guess it’s always there. I guess it stays there as well but it gets incorporated into my thinking, into my knowledge...It must compare with my beliefs, my morals, my ethics. So, it may be incorporated and discarded later...into my belief system. But...I guess the knowledge is always there... Some of your knowledge will agree with your belief system and some of it doesn’t, but you’ve got to have, I feel I’ve got to have both sides of the arguments.

The collection of statements represented by the examples in Table 3 provides evidence that this group of students could generate a wide range of features of class discussion that could be used to develop future discussions about a number of important features of learning. For example, the quotation discussing knowledge that ‘fits’ or doesn’t fit might be used to stimulate consideration of the existence of contrasting views or conceptions about a topic that might be the subject of a class lesson developed by one of these student teachers. Such a discussion could draw upon a body of research indicating that quite strong, but conflicting,
Table 3. Topics noted about class discussions.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Example</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Climate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical</td>
<td>Placing the chairs in a circle is often helpful for the exchange of ideas.</td>
<td>1</td>
</tr>
<tr>
<td>Emotional</td>
<td>I have an emotional reaction to being contradicted.</td>
<td>1</td>
</tr>
<tr>
<td><strong>Social interaction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peers</td>
<td>Because [peers] are on a similar level ...well you pick things up</td>
<td>3</td>
</tr>
<tr>
<td>Informal group</td>
<td>You have discussions when start talking to your friends or when you are</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>walking out the door</td>
<td></td>
</tr>
<tr>
<td>Bonding</td>
<td>Members at the beginning of the study period in some ways form a bond and</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>a pact that they will treat each other within certain boundaries</td>
<td></td>
</tr>
<tr>
<td>Qualities of peers</td>
<td>[With] mature aged students...I can open up more...because they have</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>more of a clue as to what I’m trying to say.</td>
<td></td>
</tr>
<tr>
<td><strong>Motivation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>I may actually just tune out and let them get on with it</td>
<td>1</td>
</tr>
<tr>
<td>Value</td>
<td>If I like something I will continue to do it.</td>
<td>3</td>
</tr>
<tr>
<td>Confidence</td>
<td>It gives me more confidence that I got what I needed out of the article.</td>
<td>2</td>
</tr>
<tr>
<td>Efficacy</td>
<td>I know I’m not a dunce</td>
<td>1</td>
</tr>
<tr>
<td><strong>Affect</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feeling, emotion</td>
<td>My emotional state has a great deal of effect on my willingness to learn</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>and participate</td>
<td></td>
</tr>
<tr>
<td>Comfort</td>
<td>I think I feel more comfortable with myself...if I come and talk to peers</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>about it and they say the same thing</td>
<td></td>
</tr>
<tr>
<td><strong>Learning style</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question and feedback</td>
<td>My learning style is through questioning and getting feedback and re-</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>questioning and getting feedback</td>
<td></td>
</tr>
<tr>
<td>Listening</td>
<td>I listen and different thoughts go around in my head...and I just sort</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>of take it all in</td>
<td></td>
</tr>
<tr>
<td>Talking</td>
<td>I’ve always been a person who learns through talking about things</td>
<td>2</td>
</tr>
<tr>
<td>Visualising</td>
<td>It was a mental picture or some sort of graphical representation that I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>could almost see</td>
<td></td>
</tr>
</tbody>
</table>
### Learning process:

#### Acquisition
- **Bounce off**
  - Being able to bounce off thoughts from our peers
  - 1
- **Pick up**
  - You might, or you might not, pick up things that you’ve missed.
  - 8

#### Examine
- **Exploration**
  - I have the opportunity to examine my ideas and interpretations
  - 3
- **Clarification**
  - I jot down points that I want clarified or I want answers to
  - 5
- **Comparison**
  - [Seeing] what is different about my idea and the other person’s idea
  - 5
- **Many angles**
  - [I ask] why did they look at it from that angle
  - 4
- **Challenge**
  - I actually kind of argue with the ideas in my head.
  - 5
- **Questioning**
  - Made me realize you have to look deeper into the information…and question some of the things
  - 3
- **Monitoring**
  - [I’m] gauging how they react to the different suggestions
  - 5

#### Transform
- **Big picture**
  - So I can get the big picture of what they’re trying to get out of it
  - 1
- **Translate**
  - I enjoy putting my views forward and that translating helps me to learn better
  - 1
- **Reorganise**
  - I might find a gap and the new piece might fit in and fill part of that gap
  - 6
- **Confirm**
  - I still…sort out the information into what is relevant to me in my viewpoint
  - 1
- **Reinforce**
  - If they’ve picked up the same points that I have it reinforces it in my head
  - 1
- **Expand**
  - It expands your learning from how you’ve possibly always done your learning
  - 5
- **Generation**
  - And see whether that forms a new pattern that I hadn’t had before
  - 1

### Problematic nature
- **Pressure**
  - I don’t want to be badgered to participate
  - 2
- **Stealing ideas**
  - I don’t like to share with people the fact that I’ve thought of it because I don’t want them to steal it.
  - 1
- **Off task**
  - I feel like my time is being wasted if…they’re completely getting off the topic
  - 1
- **Compromising**
  - You have to compromise and I just felt that was frustrating
  - 1
- **Doing all the work**
  - I just found that it would always seem to fall back on me to be the one to who would speak in front of the class
  - 1
models of a phenomenon can be held in memory by students, albeit to the chagrin of their teachers (White & Gunstone, 1989).

The data in Table 3 are, however, group data and a final objective in this project was for us to examine differences in the generative power of individual student’s knowledge.

**Phase 2: Generative power**

The sections of transcripts of nine students that focussed on class discussions were analysed using the coding system shown in Table 1. Table 4 lists in order the topics raised by one of the students, with statements related to a distinct effect being indented in the display. For this student, class discussions could have both positive cognitive and affective effects. The realisation about her own level of efficacy, of not being a ‘dunce’, is seen to have a benefit for the way that she would approach an assignment. The impact in the final section of her discussion lead her to describe a complex ‘model’ (quoted above) of how agreement between her current beliefs and new, perhaps disagreeable, information could be handled.

When pushed to explain other students had similarly interesting models of cognitive activity, as is shown in the following examples of Level 4 statements:

*But um...I suppose when I’ve said run it past I sort of had the image of you put something into a computer and it sort of scans through all the rest of the memory and then comes up with, ‘Oh yeah that fits in, that’s okay.’ So it’s amazingly fast. (Student E)*

*Metacognitive connections with a piece of information, that rings bells, and I think, I know something about that, I’ve got something in my mind[about] that. I don’t do this consciously of course, but something comes to mind and I think yes there’s something that I’ve learnt or heard or remembered that seems to make some sort of sense out of that (Student H).*

*But somehow to integrate the new knowledge, to sort of append it to the page or the pages or even perhaps to draw all the related pages from my storehouse, my library, and create a new thing, to lay them all out on the table with this new piece and see whether that forms a new pattern that I hadn’t had before, which is what I mean by synthesis, (Student H)*

*I suppose my learning style is through sort of questioning and getting feedback and re-questioning and getting feedback and that sort of cycle...so that I’m sure what I’m doing is appropriate. (Student C)*

Table 4. Content of Student A’s description of how class discussions help learning
In each of these cases we argue that the knowledge of these students had high generative power in two respects. First, the students had access to mental models of cognitive activity that could be used productively to influence their own transformation of information that is
covered by such descriptions as ‘deep processing’ or ‘complex elaboration’. In addition we suggest that if these students used descriptions of learning like those in the above excerpts with students in their own classes, there would be a high potential for those students to gain more complex knowledge about process of learning. Of course, on the basis of the current study, we do not know whether either of these effects would occur in practice.

Figure 1. Generative power analysis

The results of the coding of all students’ responses about class discussion for generative power are shown in Figure 1. For each of the nine students the bars show the proportion of the response that was coded in each of the levels listed in Table 1. The range in generative power is considerable, with three subgroups being apparent. In the case of Student F no responses were coded as Level 4 and this student, along with Student G, could identify relatively few implications of the class discussion for their own learning activity. A second group of students, D, E, B, and I, have more strongly generative profiles, while for Students C, A and H over 70% of their responses were coded as Levels 3 or 4. The high level of Level 3 and 4 codes in the responses of the latter group of students might be surprising, though it should be remembered that the format of the interview was one that invited, or required, students to provide increasingly complex explanations, if they could do so.

The pattern of results in Figure 1 suggests that students’ knowledge about the ways in which class discussions can be used to facilitate learning, which is a component of what we labelled earlier as knowledge of the domain of learning, constitutes another variable in which substantial individual differences among students can be predicted to emerge. On the basis of this analysis Students F, G, A and H have quite different potential to profit from a typical
class discussion. If the former two students were limited to involvement in a group of students with similar profiles then the level of ‘profundity’ of the knowledge constructed seems likely to be quite different from that of a group involving Students A and H. The latter two students appear to bring more powerful resources of knowledge about learning to such a discussion.

**Conclusions**

Like the students surveyed by Lawson and Askell-Williams (2001), the students in the present study expressed a wide range of views on what helps them to learn in their university classes. They focussed on their own habits of mind, their cognitive and metacognitive actions, their motivational states and their practical experiences. They also identified a set of teacher qualities and a varied set of specific teaching procedures that influenced their learning in a positive way. As in the Lawson and Askell-Williams study, class discussions was by far the students’ most frequent response to the question, “What helps me to learn in my university classes?”

The findings suggest that, as a group, these students have a high degree of affinity (perhaps unknowingly) with the social constructivist position (Palinscar, 1998; Wortham, 2001). The students see situation, interaction, detailed analysis, and explicit teaching as having a major impact on the knowledge that they construct. They also make explicit the key role of the ‘hot’, affective and emotional, features of their learning, noted by Dillon (1994). They express doubts about their self-efficacy and show that feelings are strongly involved in their engagement in discussions.

The findings set out in Table 2 draw attention to the students’ strength of belief in the value of class discussion for knowledge construction. The strength of their views suggests that we, as teachers, should consider how effectively we take into account such a strong belief in our classrooms. It has particular relevance for our use of lectures. Shulman (2000) explained that, even though educators now know that class discussion is necessary, the dominant form of pedagogy continues to be the lecture. This is because lecturing is simple: it reduces much of the technical and economical complexity of teaching. Lecturing also maintains control, for when the teacher is lecturing, the teacher knows what is going to be said. If students are invited to speak, the complexity rises and the unpredictability increases. However, short-term expediency is gained at the long-term expense of students’ cognitive gains. Of course, there is no reason why discussion between lecturer and students, or among, students, should not be embedded within lectures.
Our probing of a sample of students to seek more detailed knowledge of class discussions found that the students made explicit a set of knowledge that covers much of what has been discussed in research on class discussion. The students viewed discussions as much more than conversations and identified discussions where ideas were defined and clarified, where ideas were linked, and where explanations were developed and modified. Our participants’ accounts picked up themes identified in Tobin et al.’s (1994) analysis of how class discussions can impact on beliefs and in Dillon’s (1994) description of the development of understanding of subject matter. The interview transcripts also contained clear examples of what Pontecorvo (1987) referred to as openness to the ideas of other students. Furthermore, we suggest that in Student A’s discussion of knowledge that “fits/doesn’t” fit we see something akin to the mental models that Nuthall (1997) described as a possible benefit of class discussion. Indeed, examination of students’ mental models of how discussion affects learning would appear to be a productive focus for a class discussion. If models similar to some noted in this paper emerged then teacher and student would be using and developing knowledge in the domain of learning.

There are also some silences that deserve attention. In the student interviews, although the teacher was important as an organiser of the social-emotional atmosphere, there was relatively little attention given to the role of the teacher as a participant in the discussion. In the students’ defence it may be that their lack of concern with this component of the teacher’s role was associated with the focus in these interviews being on the learning side of the teaching-learning transaction.

We were also concerned that most interviewees expressed difficulty when asked to expand on their views about learning, though the findings in Figure 1 described above suggest that they underestimated their knowledge in this domain. However, one of our interviewees found the task required in the interview task quite daunting. Probing of his knowledge of class discussion lead him to comment that:

_I don’t know what really helps me to learn… I don’t know how that helps me to learn, it just does. It’s just something I’ve never questioned, it just helps me… it’s just the way I’ve learned to survive while I’m doing these things. But I don’t know how._

We are concerned about this student’s situation. We are also concerned that some of the students did not appear to be aware, until they were pressed for explanations, that they could generate explicit knowledge about class discussions and learning. Our results suggest that several of our students fit the profile described by Woolfolk-Hoy and Tschanne-Moran (1999) quoted earlier. When we pushed Student F to explain her views about the effects of
class discussion she did have difficulty explaining the ‘mechanism of learning’ and she did not make powerful connections between discussion and strategies that she could use to teach herself when studying. Although our students did make explicit a wide range of knowledge about how class discussions help them to learn, we did not see evidence for some of these students that this knowledge was in a state from which they could generate new ways to use a discussion to develop more elaborate knowledge representations. On the other hand, our analysis suggests that there was a subgroup of students who do have quite fertile sets of knowledge that could be used to devise either new ways of using a discussion for themselves, or models that would be useful for their own students to explore.

The generative power analysis constitutes another attempt to make statements about quality of knowledge along a single dimension. In the teacher education setting we suggest that the label we have suggested for the dimension has reasonable face validity. The commitments in the mission statements are for the most part reasonable. Teacher educators, and other educators, should want to help their students to develop knowledge of learning, including knowledge about how to exploit class discussions. If our students could develop their knowledge to identify not only the strategies for discussion, but could also recognise the implications of those strategies for a specific component of learning, and could then develop a more abstracted model of that process, they would have greater power to solve learning and teaching problems. We now need to try out this framework with other things identified as helpful for learning and see if the framework and its structure holds up.
References


Nuthall, G. (2000b) The role of memory in the acquisition and retention of knowledge in science and social studies units. *Cognition and Instruction, 18*(1), 83-139.


Knowledge about class discussions


Knowledge about class discussions


