

PBL Groups: What are they doing? A student work in progress

VJ Skinner¹, TA Winning¹, A Braunack-Mayer², G Mullins³, R Peterson⁴

¹Dental School, The University of Adelaide, ²Department of Public Health, The University of Adelaide, ³The Graduate Centre, The University of Adelaide, ⁴Medical Education Unit, The University of Adelaide, South Australia

Abstract

This paper will discuss preliminary findings from the first phase of a PhD research project on students' experiences of group work in PBL. The project is a multi-method qualitative investigation of group work in problem-based learning, using participant observation, questionnaire, and semi-structured interviews with students and PBL facilitators. The first phase is being undertaken in 2004 at the University of Adelaide Dental School. The paper will discuss findings from participant observation and interviews in relation to how a PBL group developed its approach to learning.

Introduction

Group work is a major component of problem-based learning (PBL) and is intended to support specific learning outcomes through students' participation in PBL group activities (Barrows 2000). Its use has a basis in cognitive, constructivist theories of learning and memory (Schmidt 1989; Savery & Duffy 1994), and sociocultural theory (Gijsselaers 1996; Hmelo & Lin 2000). The PBL 'learning cycle' involves a stepwise systematic investigation of a PBL problem, which is a real life scenario that students investigate and manage (Fig 1). The key features of PBL are that the problem drives the learning; there are no prior formal teaching/learning activities; the students work in small, collaborative learning groups to identify what they will research in order to understand the problem better; and the teacher's role is that of a 'facilitator' who guides the students by modelling the investigative process (Barrows 1986; Charlin, Mann & Hansen 1998).

Research into PBL group work has shown that the intended outcomes of group work can be achieved by particular group processes. For example, small group discussion can support students to use existing and develop new understanding of concepts (de Grave, Boshuizen & Schmidt, 1996; de Grave, Schmidt & Boshuizen 2001; Schmidt et al 1989). Through PBL group work students can develop reasoning ability (Hmelo 1998), and self-directed learning skills, including an ability to identify learning issues and hypotheses relevant to the PBL case (Hmelo & Lin 2000).

Since PBL outcomes are more likely to be achieved by students working together rather than individually, understanding the ways that groups work is important for successful implementation of PBL (Faidley et al 2000; Holen 2000). Group processes and group dynamics have been investigated extensively, leading to explanations of the influence of facilitator expertise (Davis et al 1992; Davis et al 1994; Eagle, Harasym & Mandin 1992), the nature of facilitator and student interactions (Wilkerson, Hafler & Liu 1991; Schmidt & Moust 1995; Tipping, Freeman & Rachlis 1995), and the role of various cognitive and behavioural factors in group functioning (Dolmans, Wolfhagen & van der Vleuten 1998; de Grave, Dolmans & van der Vleuten 2002; Willis et al 2002).

However, an assumption underlying much research into group processes is that students share the researchers' understanding of the nature and purpose of PBL groups. Student and staff understandings of the group purpose and process have been found to differ in several PBL

studies (Chaves, Lantz & Lynch 2001; Duek 2000; Steele, Medder & Turner 2000). It is known that students' approaches to learning and their responses to a learning context are influenced by factors such as their perceptions of the learning context, their prior learning experiences, and their previous learning habits (Biggs 2003; Prosser & Trigwell 1999; Vermetten, Vermunt & Lodewijks 2002). Research on students' approaches to learning in PBL has shown that students had widely varying perceptions of PBL (Duke et al 1995; Skinner, Winning & Mullins 2003), and experienced varying PBL learning outcomes (Forbes, Duke & Prosser 2001). Studies of non-PBL group work have shown that students in different disciplines had very different perceptions of and approaches to group work (Legge, Wilkens & Prosser 1995; Tempone & Martin 1999). Therefore, an important direction for PBL research is to explain how students understand group work in PBL.

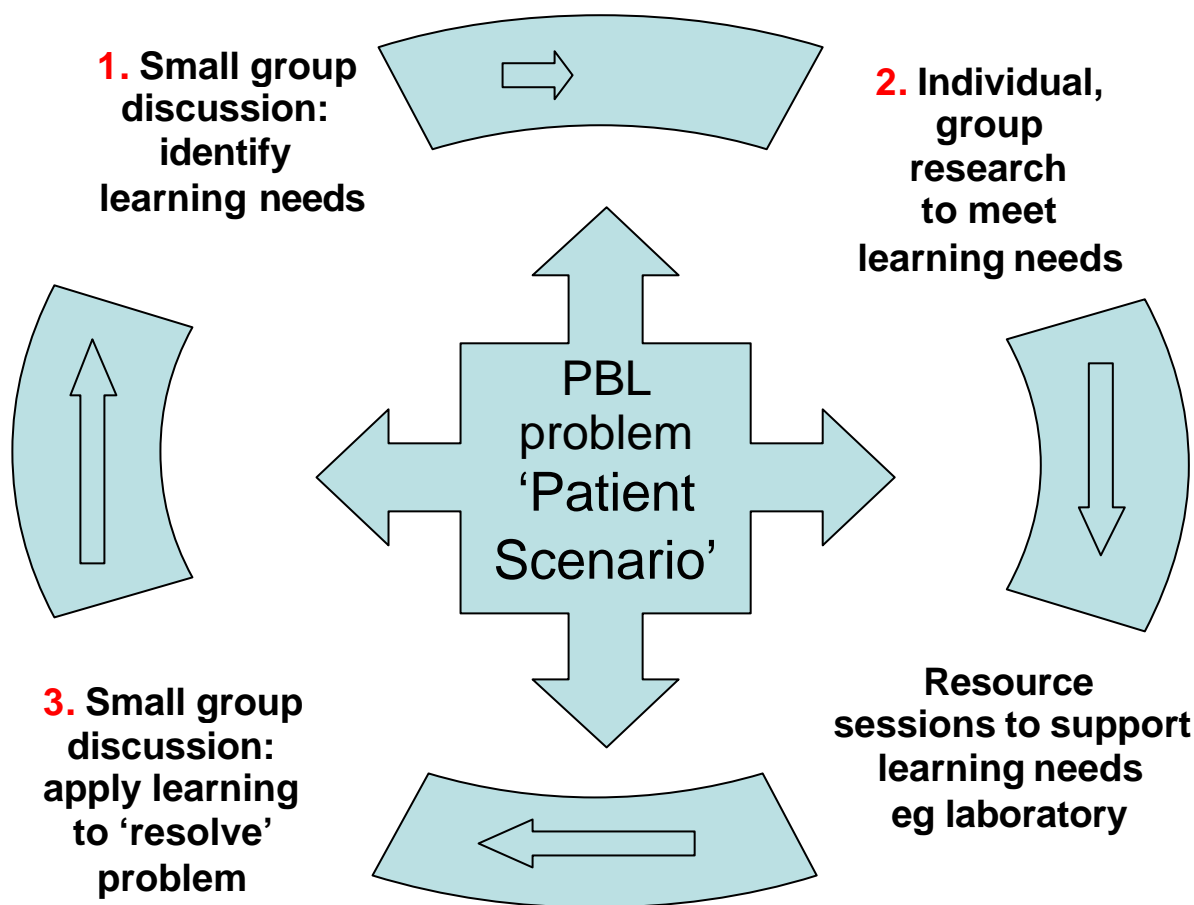


Fig 1: The PBL cycle (Adapted from PROBLARC 2000)

Aim

The aim of the study is to explore group work from the students' perspective and explain what students do, and what they think they are doing, during PBL group work. The research questions are, 'What do groups do?' and 'What students do, think, and feel during PBL group work?' The objectives include explaining how a PBL group develops and functions, and how PBL group membership develops and functions.

Participants

This paper presents a case study of one first year PBL group from a larger study of several PBL groups. It describes and explains the development of the group during the students' first

semester of PBL in dentistry. Participants in the full study were first-year students in the Bachelor of Dental Surgery programme at The University of Adelaide in 2004. First year students were selected because this is a crucial transition year for the majority of students. Most are experiencing PBL for the first time, and many, including school leavers and International Students, are new to an Australian higher education environment. Thirty first-year students took part in the initial participant observation phase of the study, of which twenty one students in three groups were invited to take part in the interview phase of the study. Fifteen students, about five from each of the three groups, participated in an interview about their experience of group work. The distribution of gender, age and school leaver/international student/tertiary transfer student ratio in the sample was similar to the whole class distribution.

This paper focuses on the first-year PBL group called '1 Yellow'. The group was comprised of seven students, four female, three male; on entry to Dental School all were school leavers except one student who had done a year of a science-related undergraduate programme. Four of the students were local, from South Australia and interstate, and two were International students. Their ages were 17 to 19 on entry to Dental School. None of the students had prior experience of PBL. During Semester 1, 2004, they completed six PBL cases.

Methods

The study used a qualitative approach with multiple methods of data collection, including participant observation, survey and interviews. The multi-method approach was designed to provide a detailed explanation of PBL group work from the students' perspective, and contribute to the methodological and interpretive rigour of the results (Rice & Ezzy 1999). Ethics approval was granted by The University of Adelaide Human Research Ethics Committee.

Participant observation was conducted over 12 weeks in Semester 1. This involved face-to-face and video observation of four first-year PBL groups (code-named 1 Yellow, 1 Blue, 1 Red, 1 Green). Each group was directly observed (ie face to face) for one PBL case (two to three sessions) and videoed for a second PBL case (two sessions). Scheduled PBL class sessions and out of class group work were observed, and included informal conversations with students about their activities. All groups had at least two non-observed PBL cases between their first and second observed cases, so as not to be too intrusive for students. Participation was "moderate" (Spradley, 1980); the observer did not participate in the PBL investigation, but occasionally joined the social conversation during sessions. At the end of Semester 1 students completed a 30-item questionnaire about their experience of group work, derived with permission from the Learning Team Survey for PBL groups (Connolly and Wilson 1992; Faidley et al 2000).

Three of the four observed groups were selected for further participation with interviews. This measure was so that staff who facilitated the observed groups would not know which groups were interviewed. Consenting students participated in a single, semi-structured interview that was taped and confidentially transcribed for analysis. Each interview, lasting approximately one hour, was loosely structured so that students could shape the interview from their own experiences and points of view (Seidman 1998). The interviewer used the following questions to shape the interview and asked follow up questions in response to whatever students chose to talk about:

- Would you like to start by describing your group?
- What were the good things about group work/being in a group?
- What were the not so good things about group work/being in a group?

An inductive analytical approach was used that worked between themes emerging from the data as a whole and codes grounded in the data at a fine-grained level, which lead to

propositions about how a PBL group develops (Strauss & Corbin 1994; Taylor & Bogdan 1998). The first author conducted the analysis in close consultation with the third author, and general consultation with the other authors. Analysis was done on hard copy initially, and then continued with the qualitative data analysis software programme, NVivo.

PBL at the Adelaide Dental School

Students worked in small groups of seven, one facilitator worked with two groups simultaneously. In the first step of the PBL cycle (Fig 1) the students analysed a problem scenario to identify the problems or issues they needed to consider as dentists, to consider what further information they needed to understand and manage the patient situation, and to select learning issues for independent research. During the second step of the cycle the students were asked to conduct independent learning research as a group. The students then reconvened for the third part of the cycle in new groups, comprised of representative students from different small groups who had researched different learning issues. This session was for students to discuss, share, and apply their new learning to the management of the PBL problem. The timetable included scheduled PBL class times and several timeslots marked 'self-directed learning' (SDL) that students could use for their independent group work. A task requirement for independent group work was that each group would submit a brief summary of their research so that i) students would learn to structure and apply their learning, and ii) group facilitators could coordinate the discussion around each groups' work.

Development of the PBL group, 1 Yellow

This report focuses on what 1 Yellow did during independent group work between the scheduled class sessions, i.e. part 2 of the PBL cycle (Fig 1), since this is the 'invisible' part of PBL as far as facilitators are concerned. The scope is restricted to the 'work' part of 1 Yellow's activities and does not extend to the social aspect of the group, or group dynamics and relationships, or outcomes. The account of 1 Yellow's development as a group is based on the participant observation with the whole group and interviews with five of the group members: Amy, Bruce, Carla, Catie and Philip. All were school leavers, and all were local except Catie, who was an International Student from South-East Asia.

What did 1 Yellow do? The work and the tasks

From observation of and conversation with members of 1 Yellow, it emerged that the students identified the between-class 'work' of the group as producing a tangible outcome. When 'work' or 'workload' or organising the group to work between sessions was mentioned, it was in the context of preparing their group summary for submission. Bruce's depiction of it as "the final product" is typical of the group's understanding of the group's work. All group efforts were directed towards completing the 'work'. 1 Yellow's work related tasks were a series of separate administrative ('organisation') and information handling tasks. The group organised itself 'on the fly', quickly deciding who would do what to get their summary ready:

we usually just hang around afterwards and say 'you do this bit and I'll do this bit' (Amy)

we would just meet after the lecture, after the PBL session, and just say 'okay since you did this last week, I'll do it this week' and then we would just say 'we don't really have time to meet so we'll just communicate via email, what you have you send it to me, and I'll put it all together' (Bruce)

I think the last two DLPs, the group didn't meet together at all. Apart from at the end of a lecture, 'hey, just wait one second, one second, this person's going to do it this week, everybody okay? Okay' [said really quickly] then go off. (Carla)

Information handling was a series of tasks comprising 'researching', 'compiling' and 'presenting' the group's learning issue. Students constructed 'research' as 'gathering information', which meant finding resources and relevant information, copying or cutting and pasting it, and then delivering it to the person who would compile or collate the individual pieces of research. "Compile" and "put it together" was how students referred to making the final product out of everyone's information. Apart from submitting a copy to the facilitator, the purpose of the group summary was so that the information gathered and compiled by 1 Yellow could be given to the other groups in the next PBL session. Therefore students represented the group discussion of learning issues as "presenting" (Amy, Bruce, Carla, Philip) your summary and "listening" to other groups' summaries (Bruce).

And Catie [...] used to do a lot of research and used to say 'Well this is what I found. I cut and pasted it from the internet. (Amy)

I think the point - sometimes I think that the point is, is that there is so much information that we need to know, that the reason that we do this is to split it up and we don't all have to research it. We can just get the information from someone else's summary. (Amy)

and you also learn who's the best at doing this, and who's the best at doing that. So you might say 'okay you're really good at finding stuff that we need so you go and find stuff', 'sure'. And some people might be more - better at expressing, at collating information, so they would be the ones that put it all together. (Bruce)

sometimes in those twos, one person would just do the research and the other one would put it all together. (Carla)

somebody would post up the researched material on the discussion board and one person did the summary (a volunteer) (Catie)

The first few packages we took a long time, we wasted time on researching rather than discussing (Catie)

usually one gathers and one types each week (Philip)

How did 1 Yellow work? Group Strategy

1 Yellow developed its way of out-of-class work during the semester. Both in casual conversation and in interview, the way 1 Yellow worked and how this came to be was explained by all students, so it was quite clear what they did and why. Initially, for 1 Yellow "when it came to the work, we tried first of all to work as a team" (Philip), which meant they attempted to split their chosen learning issue into parts that everyone could research part of and then they met to put their research together into the summary. When this proved "too hard" (Carla) because "it wasn't going to work" (Amy) they adapted their way of working.

1 Yellow's eventual strategy was to adopt a system of rotational division of labour to share the workload. 'Rotation' meant both taking turns at doing the various tasks, and also taking turns at working or not working for any given PBL. The students explained how each week in their organisational discussion they would decide 'who will do what for this PBL, and that not everyone works' (Amy, Bruce, Carla, Catie). Generally "individuals" did their own research (Catie), and each week "half the group" (Bruce) or "sub-groups of twos and threes" (Carla) would work on a PBL. When it came to making the group summary, each week one person volunteered to do it, and they took turns at volunteering.

So, at first we tried to split it up, probably about the first two or three [PBLs] and then we just went 'this isn't going to work', and I think (pause) I think Bruce was the first one to do one all on his own, and then from there on in we all starting doing it like that and it seemed to work better. (Amy)

The way the group worked became automatic: all of us agree to use the discussion board as a communication channel, people take turns to do the summary work (Catie)

And so, the next time, and for most of them except for one more, we decided, yeah, just to get one person to do it. I think that was more productive and we all trusted each other I think to (pause) just fulfil their role when it came to that time. So eventually everyone had to take a go at typing or gathering information. Usually one gathers and one types every week. (Philip)

Why did 1 Yellow work this way? Students' rationale

The rationale underlying 1 Yellow's work strategy was to balance the demands of the course in the time available, and fitting the group's PBL task into a busy schedule. A major issue for everyone in 1 Yellow was time. People talked about adjusting to different time at university (longer days, longer classes, being tired), the lack of time to do things when there were so many things to be done, and the issue of coordinating time among seven people with busy lives and the time it took to work together as seven in a group.

But when push comes to shove, it's due in on the Monday, and then we have to present it on the Tuesday. So if we've got other things that are due on the Tuesday, that [ie PBL work] just gets put on the back burner and doesn't get done until lunchtime beforehand. (Amy)

I have this mentality that it's going to take too long and I just want to go to bed. Because (pause) I feel as if it's a long day for me and I know that it's a long day for everyone else, but I have a lot of travelling time in my day. (Amy)

And (pause) and I'm not sure if this is actually relevant to your research but I think that they were expecting us to do too much in the afternoon because it was, because after you come out of three hours of the clinics or lab, where we're trying to get as much done as we can as quickly as we can, because it's your only chance to do that, and then after that you're just too tired do anything. (pause) So, and it's a beautiful thing, the theory, but in practice I think it's not really all that useful. (Bruce)

And a few weeks later we just realised that it [PBL] wasn't really such a big deal any more. That really we had other things to worry about, such as assessments, because they were all coming up. We had to worry about our clinical performance. We had to learn about every other thing, every other aspect about dentistry and (pause) and then we just found that we didn't really have the time for PBL as well. (Bruce)

Sort of in the middle of the semester just the amount of work that we had for the course and then even finding time for those twos and threes to meet was getting difficult as well and then I mean, sometimes in those twos, one person would just do the research and the other one would put it all together. So, even that way, it sort of ended up being individual as well. (Carla)

The reason it didn't work like that [ie team work] was because of time there was no time for group work; we had lots of study to do as well as PBL; also the timetable was a problem, because we did our DLP on Tues, and we had no time to research and meet during the week, so we had to do our research on Sat and Sun, then we rushed to pass our summary up on Mon. The way it worked was that individuals would do their own research (on the weekend) (Catie)

And so I think I still haven't found a very good balance between having time for other things and study, and I guess where the disheartening part was, was I spent lots of time and just reading and I felt that was wasted time. I guess everyone has to do it at uni, it's just something that I have to get used to still. (Philip)

As a result of these pressures everyone had to prioritise their workload and find easy or efficient ways to get things done. Group members talked about the group goal of just 'getting it done', 'out of the way', and being 'efficient'. The group goal for PBL was producing the group summary and since everyone perceived that PBL was not assessed the students assigned a lower priority to PBL. Students repeatedly pointed out that 'PBL was not assessed' because the group summary was only 'formative', whereas they had other work that was to be handed up for marking. The students explained during conversations that they were aware that they had a PBL-based exam at the end of Semester, but as this was weeks away it didn't rank as assessment for immediate purposes. If the group's task was completed efficiently people in 1 Yellow could focus their efforts on the other demands on their time, especially other, marked assignments. This is why 1 Yellow's group members could share the workload each week and feel comfortable not working on every PBL.

and then we just found that we didn't really have the time for PBL as well. So we found a really efficient means was just (pause) we would - I think towards the end our work was getting a little sloppy but it was still passable. (laughs) And it sounds awful - we would just meet after the lecture, after the PBL session, and just say 'okay since you did this last week, I'll do it this week' and then we would just say 'we don't really have time to meet so we'll just communicate via email, what you have you send it to me, and I'll put it all together'. And someone would volunteer to do that every week and it just got it out the way for everyone else. (Bruce)

It seemed as though - it was just a matter of - at the end of the day we just want to get it done. So to do that the easiest way possible was just for people to do it individually. And even though we knew that wasn't the concept that the dental school was aiming for, to do it individually, it was just much easier, not as much of a hassle and you didn't have to put as much work into it, or as much work into the group work and finding time, it just happened individually. (Carla)

In addition to the time-related issues of working as a group of seven, students struggled with collaborative writing, which was possibly a new activity. At first they tried to co-write a group summary as seven people but it became an additive exercise with seven lots of research being added together. It proved difficult to negotiate how the final product might look with seven people's preferences to consider. Their aim was to put everyone's information together so that it flowed and the style was even. Their way of managing this was to give the task to one person, who would 'compile' the research gathered by others. This worked and made it easier to meet the set limit of 2 pages maximum for a summary.

it's so hard to split up the topic so that everyone does equal work. [...] Sometimes if the question's split up into about three parts we'll go in pairs. But even at that one person in the pair ends up doing more work than the other person in the pair. And the way it's if the question's split into three, those three sections aren't necessarily on equal weighting, as in equal workload weighting. So, at first we tried to split it up, probably about the first two or three [PBLs] and then we just went 'this isn't going to work' (Amy)

So, I guess it [doing PBL] helps you break it down to (pause) workable parts, because with seven people it's too hard to divide it into seven things. It's much easier dividing in two. One big chunk and another big chunk, and just to share that out. So in terms of time management I think it helps us know how to prioritise our time I guess. (Bruce)

The lack of time that we had to put this together. The difficulty in trying to find everybody and find an appropriate time to meet. The difficulty of the logistics of trying to get 7, 6 people's work and put it all together and make sure that it all flowed and matched. (Carla)

I think it just sort of happened because after we got back the first one and it said, 'too long and you have to reduce it' and all that sort of stuff and we thought what's the point of researching the same thing seven times? Writing the same thing down in seven different ways and then trying- someone to read seven different things and put it together in one piece of work. Well that's what I thought. It probably wasn't formalised, that wasn't actually spoken of formally, but I think, I think everyone thought that generally. Like we sat there, from like there, and then, I can't remember who it was, but someone just volunteered, 'I'll do it this week and someone else can do it next week'. That's how it started. (Philip)

What did people in 1 Yellow think of their group's way of working?

During conversations and interviews the members of 1 Yellow, without prompting, evaluated the pros and cons of their group's work strategy. Their talk constructed the group in two ways, as a unit and as individuals. The people interviewed were unanimous about the suitability under the circumstances of their work system for productivity of the group. The unit had benefited from getting its assigned job completed efficiently and the individuals in the group had benefited from their group's sharing of the workload. Evaluative comments were that the group's system "seemed to work better" (Amy), it was "a really efficient means [...] that got it out of the way for everyone else" (Bruce). Carla observed, "I mean, once you're put in a group you have to deal with it and then maybe get into something that you can work with. I think that's what we did. We just made it into what we needed from it." Fairness through shared input was a positive feature of 1 Yellow as a group.

it was all fair, people did work, it wasn't like anybody didn't do anything. It was more of that rotation thing though. (Carla)

we knew someone would come up with something (Catie)

at your turn everyone could be quite-hardworking (Bruce)

we could rely on each other (Philip)

However, enthusiasm for the system varied among members of 1 Yellow. During the interviews Amy, Bruce, Carla and Catie commented on some disadvantages of 1 Yellow's

approach. All four suggested that the individuals in the group had missed out to some extent on participation or learning.

we adopted pretty bad habits I reckon we had in the way that we sort of gave one person the whole workload. I thought that was quite a bad habit to slip into. That would be a bad thing [said reflectively]. And also, because all the workload went onto one person I think some people in our group thought that that meant they could be, you know, relax and kick back, and not really have to worry about, you know, the group discussion. I think that the emphasis was no longer on the group discussion. The emphasis was 'who is going to do the write up' and 'can you please get it done early enough so the rest of the group can read it before we have to present it.' (Amy)

Like, I think we really took the easy way out by just really doing a bit of work and dumping it all on one person. And (pause) you could be really lazy if it wasn't your turn but when it did come to your turn everyone was actually quite hard-working, I think, so they could put something together. So (pause) I think if people were more motivated [rising inflection] to express their views then we might have got a bit more out of it [rising inflection – tone suggests he's testing an idea/ possibility]. (Bruce)

I mean, having that person do it individually, if we had to do it that way, okay, but I then I would have liked for the group to sit around with everybody having that two page copy and going through it and understanding it. I think that would have made it more of group work. (Carla)

I wanted to discuss the research with other group members because I think this would have helped our learning. (Catie)

Philip was the only member of 1 Yellow interviewed who did not express dissatisfaction with how the group worked to get their summary done. He commenced his interview by briefly explaining how 1 Yellow had worked, how this came to be, and ended his explanation with his evaluation of their system.

Usually one gathers and one types every week and, yeah, I was, didn't experience any problems with it. It was good, and easy to work with. (Philip)

Discussion: Constructing group work

The students identified the between-class work of the group as producing something tangible to be distributed within and beyond the group. They constructed the independent research phase of PBL as a series of concrete tasks related to organisation and information handling. Organisation meant administration, not structuring learning or knowledge. The tasks were separable and various aspects of information management (gathering, compiling, presenting) could be undertaken by sub-groups of individual group members each week. Initially the group attempted what they regarded as 'teamwork', by having everyone find information and trying to compile it together. However, in response to the difficulty of managing time and workload and the challenge of collaborative research, they adopted a rotational work-sharing system. Although 1 Yellow's work strategy gained acceptance by all members because it met their immediate needs, Amy, Bruce, Carla, and Catie expressed some dissatisfaction with the system. So what enabled the students to construct out-of-class PBL group work in this way?

The way students in 1 Yellow constructed their work and approached being a group can be linked to a range of factors that include students' personal epistemologies and their previous experiences of learning, learning activities, and group work. The way they perceived and responded to aspects of the learning environment, such as their workload and managing time, also shaped how 1 Yellow undertook PBL group work. These factors are discussed further in

this paper. Gender, age, and cultural influences, which are not discussed at length here, also contributed to the way that students regarded group work and its purpose and processes.

Students' epistemologies were reflected in how they talked about knowledge and information and learning and the way they acted in relation to these concepts. As a group, 1 Yellow had operated from an objective viewpoint of knowledge as an external phenomenon that could be gained and increased through gathering and recording information as facts. Individuals talked about knowledge as information and facts, and this was reflected in how they worked as a group. The students had constructed the work of researching their PBL learning needs as information gathering, and collating, and presenting. Since the group's approach to 'information' or knowledge was quantitative, they could talk about dividing topics and workload into pieces and adding work together. This is how students were able to construct group summary writing as an information handling task, with the focus on format and style.

However, individual students in 1 Yellow had varying attitudes to learning and group work and this is how the change in 1 Yellow's approach over the semester and the variation among individual members' experiences and evaluations of 1 Yellow can be understood. To illustrate this perspective, three members of 1 Yellow are discussed. They were selected as representing different epistemological and experiential viewpoints and divergent experiences of being in 1 Yellow. Carla shaped 1 Yellow's initial approach and she was least satisfied with their rotational turn-taking system of work, Bruce was the instigator of the group's one person rotational system, and Philip was most satisfied with how 1 Yellow worked as a group.

Individual approaches to 1 Yellow and group work

Carla's interpretation of group work was working together rather than as a system of cooperating individuals. In observation sessions Carla was very group-oriented. In PBL she contributed to the 'content' of discussion and also monitored group process and tried to help and reassure other group members who were confused by PBL. She envisaged group work as discussing what they were "trying to research" and what we wanted to accomplish", and then coming back together to "discuss our learning". Carla had a constructive, meaning-making view of knowledge and learning, and she regarded students as active knowledge builders. She talked of "understanding", "talking about our learning", and "learning through discussion and doing things". She was adamant that discussion would have helped their understanding and learning. Carla regarded group work as involving interdependence and shared "responsibility" because people were "involved in other people's learning". She talked about facilitators as people who could guide the group's learning through making a discussion from key facts, not through having people read from summaries. She related an instance of being in a group in which she had learned, unlike her experience in 1 Yellow, because it involved "discussion", "understanding what people were saying" and being "involved" rather than letting "somebody else do it". Carla appeared to be the least member satisfied regarding 1 Yellow's system. For her there was a tension between the group as a unit and the group as individuals.

It sort of defeated the purpose of group work and I don't think I really paid that much attention to it then, but looking back on it, it really wasn't fair on them or on the whole group because then the group didn't get that experience of group work. [...] because if I did it all by myself, I wouldn't go to somebody else and say, 'hey can you read this before I email it off'. It would just be my work and I mean it was - I am contradicting myself saying it was a fair group and it's not a fair group, but in that way it was fair that everybody had a go at doing it by themselves, but then when you look back on the actual group, it wasn't fair on the group that this work was submitted without anybody else having a look at it and the group didn't get a chance to discuss it. (Carla)

The focus of Bruce's interview was the difference between PBL in theory ("a beautiful thing") and in practice, ("not that useful"). Bruce formed the impression PBL was "silly" after the first week as a result of the group activities, when he concluded that the learning "was something that we could really have done by ourselves". Bruce's engagement in the group was directed toward the content of the PBL problem; he did not participate in the group's monitoring of its PBL or group processes. He was one of the quieter members of 1 Yellow, and the quietest local student in the group. Bruce appeared to use a transmission approach to learning, with students being knowledge deficient, and saw an ideal teacher as one who helps the student by providing information. He said several times that students "don't know anything". It was his opinion that for certain PBL problems there is "no way that you could approach that topic unless the facilitator came in and said 'this is what happens and this and that'". Bruce's impression of PBL and group work as not useful for learning lasted throughout the semester. He concluded that PBL was "more skill-orientated than knowledge-orientated". For Bruce, learning was an independent activity, considering "the fact that you essentially do all the knowledge-based things yourself", and he found it "easier to learn from a textbook". He did not find group work useful for his way of learning (ie 'knowledge'): "learning in a group isn't the most effective way [...] I prefer to do it myself". However, Bruce valued the group experience for the group skills (eg communication, work-sharing) he developed, which he thought would be useful for him as a dentist.

Like Bruce, Philip's preference was for working alone. In his interview Philip focussed on making sense of PBL from the point of view of his personal learning and his career as a dentist. In observation sessions Philip's initial contributions were directed only to content of the PBL problem. Following the trial exam he became concerned with understanding how to do each step of PBL properly for the end of semester exam, and he began to comment on PBL process, trying to keep the group moving through each step. Philip had constructed teachers as knowledge authorities; he said knew that what they taught was "truth" and "correct" because "they've been to uni". Whereas when having learn "off a student" he was "wary" and "uncertain". So the group discussions, for example in the third step of the PBL cycle, were a "waste of two hours" for Philip. However he said 'I would always still go to the thing because you miss out on things the tutors say and that's important, but you could just cut out all that other stuff, that's what I would prefer.' Like Bruce, learning for Philip was a solo activity. He had interpreted "self-directed learning [as] when you go off home and do it", and "self-directed learning [was] where most of the learning was done for me". So Philip's view of group work was that "I prefer to work by myself" since it takes "not as long to do things".

Construction of 1 Yellow as a PBL group

Group members' different epistemologies and experiences and circumstances influenced the way 1 Yellow was constructed. As shown in earlier studies on students' conceptions of PBL (Duke et al 1995; Forbes, Duke & Prosser 2001), individual students in this study had quite varying impressions of what PBL group work ought to entail. Carla's, Bruce's and Philip's prior conceptions of learning and their previous experiences of group work had shaped their initial approach to PBL group work (Prosser and Trigwell 1999). However, students' approaches to learning are not fixed and students can adapt according to their perceptions of the learning environment and what is required (Biggs 2004; Prosser and Trigwell 1999). At the start of the semester Carla influenced the group to work her collaborative way by adopting a leadership role and suggesting they break into sub-groups to research and come back together to discuss what they were learning. But as she and others explained, eventually time and workload became issues and it got "too hard". So when Bruce volunteered to 'do one all on his own' in a manner consistent with his beliefs, everyone willingly accepted this suggestion for easing the load. Hence their general consensus that 1 Yellow's approach suited their needs.

the way that the students treat [PBL group work] you just, I think we intentionally create it so it's less stress. So that we can concentrate all our efforts elsewhere. (Bruce)

So in that sense the group was - it was a really good group who were..., they'd help you and they'd all work together, even if it was working individually, it would be because you were all working together, if that makes sense. (Carla)

The students in 1 Yellow struggled to adapt to the new task of working collaboratively at the conceptual level. Bruce and Philip were possibly unfamiliar with discussing and writing to construct understanding. Their framing suggests they regard knowledge as an external thing that students take in, so the role of someone who knows (teacher or other student) is to explain what's in the text. This coupled with their attitudes to teachers as knowledge givers or authorities, suggests that Bruce and Philip may operate with a 'dualistic' form of thinking, in which things are either right or wrong, and there is an answer to be found (Perry 1999). Hence they had difficulty with the concept of co-constructing knowledge with other students, and with managing the uncertainty this brings. Bruce described his only experience of group work from high school as "science practical" and not "sitting around a table talking"; Philip talked of group work as getting "the task done". Therefore they constructed the task as similar to past group working experiences of completing a task in their group and/or producing a product. In addition, their previous experiences of learning with other students were put as explaining to each other in "study groups" when they didn't understand, or "helping people". Possibly, as successful students throughout school (entry to Dental School usually entails a high TER), Basil and Patrick have rarely needed other students' input for their learning?

the only advantage I see in a group is that you can help people understand one day what they don't understand, because this subject comes easier to you, where as someone else might find this particular subject easier and they can explain it to you. So when you're in study groups and it's really that you just do your own work, you know, 'I don't know what that mean' so I'll ask the person sitting next to me. (Bruce)

Traditionally, I think, and all through school, I think, I prefer to work by myself because (pause) I usually understand what we're doing quite well, and therefore I didn't really- although I like helping people and I always would, I could usually get the task done quicker by myself than with another person because then you have to organise meetings and you have to discuss it and think about, 'alright this is what you want to do and this is what I want to do let's find a compromise'. Whereas when you do it yourself, you just have you to think of, what you need to do.

1 Yellow's system of group work was a group response to circumstances, especially workload. When students felt pressured with workload, it became the assessment that not only drove learning but also determined their priorities (Ramsden 1992). Although 1 Yellow's system was useful for completing the summary task, Carla could not be entirely happy with it because it was not congruent with her personal view of learning as constructive and interdependent. On the other hand, it suited Bruce and Philip because it fit with their understanding of learning as independent intake and their view of the roles of teachers and students in the knowledge relationship. Philip was happy with the system, while Bruce seemed to come to the conclusion in interview that it did enable people to be lazy when it wasn't their turn, although he maintained his opinion of the PBL group as "not useful for knowledge".

In addition to student's ideas of knowledge and learning, age, and social, emotional and cognitive development, may also be important factors for how groups form and work. The issue of how PBL might be implemented with "less skilled" and/or "less mature" students, especially in relation to self-directed learning and collaboration, has been raised recently as an issue (Hmelo-Silver 2004). The students in 1 Yellow were 17-19 years of age when they commenced PBL group work and most were from school. They expressed confusion with self-directed learning and were reluctant to express disagreement with each other (an important aspect of the group for them was that it was a "happy", "easygoing" group), and these factors may be related to development. Since absence of conflict does not necessarily mean that a group is functioning smoothly (Hitchcock & Anderson 1997), it will be important to compare the experiences of older students with previous degrees or experience to see how they managed disagreement in their groups.

Gender and culture may emerge as key considerations that shape the development of PBL groups. The female members of 1 Yellow were more group- and process-orientated and wanted to work collaboratively, while the male members were more individual and outcome focussed. Catie, as an International Student, said she experienced cultural difficulties in speaking out and was reluctant to take an organising role in the group. Duek (2000) has suggested that developing "positive interdependence" in PBL groups, as Carla had hoped for, does not just happen and she argues for better understanding of how these factors operate in PBL groups in order to achieve collaboration.

Conclusion

The development of 1 Yellow's approach to work as a PBL group was a complex interplay of individual students' understandings and previous experiences, and shaped by students' responses to their new learning environment. Students constructed PBL group work in terms of their personal epistemologies and learning experiences. To manage new and unfamiliar learning activities they framed their group work in terms of what was familiar and understandable. They also had to adapt to manage the pressure of their workload and lack of time. The goal of the group's work became the printed product. The out-of-class group work between PBL sessions was transformed from an initial, collaborative and joint construction task to a series of separate, information handling tasks undertaken by different group members. Group discussion about learning did not occur because for some it did not fit their understanding of how learning occurred, and for others although it was congruent with their epistemology it did not suit the circumstances of the learning environment.

So it is suggested that PBL group work is constructed through members' negotiating across individual epistemologies, conceptions and experiences of learning and the learning environment. However, the form a group's approach to learning takes is not necessarily congruent with the approaches to learning of its individual members, as shown. This may have effects such as the separation of 'work', as something done to satisfy task requirements, from 'learning', as something done alone in preparation for the exam. Further work will explore this issue and its implications for the implementation and outcomes of PBL. The ongoing analysis will address the complexities of PBL groups to explain how the group dynamic and relationships developed, and how individual membership of the group developed.

Acknowledgements

Many thanks to

The students who participated in this study.

My supervisors for their guidance and support.

This research was supported by

The Australian Dental Research Foundation Research Grant 2004

The University of Adelaide Faculty of Health Sciences Divisional Postgraduate Scholarship

References

- Barrows, H. 1986. 'A taxonomy of problem-based learning methods'. *Medical Education* 20: 481-486.
- Barrows, H. 2000. *Problem-based Learning Applied to Medical Education*. Springfield, Illinois: Southern Illinois University School of Medicine.
- Biggs, J. 2003. *Teaching for Quality Learning at University: What the student does*. Berkshire, UK: Society for Research into Higher Education & Open University Press.
- Charlin, B., Mann, K. and Hansen, P. 1998. 'The many faces of problem-based learning: a framework for understanding and comparison'. *Medical Teacher* 20: 323-330.
- Chaves, J., Lantz, M. and Lynch, M. 2001. 'Tutor and student perceptions of the tutor's role in problem-based learning'. *Journal of Dental Education* 65: 222-230.
- Davis, W., Nairn, R., Paine, M., Anderson, R. and Oh, M. 1992. 'Effects of expert and non-expert facilitators on the small-group process and on student performance'. *Academic Medicine* 67: 470-474.
- Davis, W., Oh, M., Anderson, R., Gruppen, L. and Nairn, R. 1994. 'Influence of a highly focused case on the effect of small-group facilitators' content expertise on students' learning and satisfaction'. *Academic Medicine* 69: 663-669.
- de Grave, W., Boshuizen, H. and Schmidt, H. 1996. 'Problem-based learning: cognitive and metacognitive processes during problem analysis'. *Instructional Science* 24: 321-341.
- de Grave, W., Schmidt, H.G. and Boshuizen, H. 2001. 'Effects of problem-based discussion on studying a subsequent text: A randomized trial among first year medical students'. *Instructional Science* 29: 33-44.
- Dolmans, D., Wolhagen, I. and van der Vleuten, C. 1998. 'Motivational and cognitive processes influencing tutorial groups'. *Academic Medicine* 73.
- Duek, J.E. 2000. 'Whose group is it, anyway? Equity of student discourse in problem-based learning (PBL)' in Evensen, D. and Hmelo, C. (eds.) *Problem-based Learning: A research perspective on learning interactions*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Duke, M., Forbes, H., Hunter, S. and Prosser, M. 1995. 'The perceptions of problem-based learning (PBL) held by undergraduate students of nursing: A progressive analysis.' *Research and Development in Problem-Based Learning* 3: 137-147.
- Eagle, C., Harasym, P. and Mandin, H. 1992. 'Effects of tutors with case expertise on problem-based learning issues'. *Academic Medicine* 67.
- Faidley, J., Evensen, D., Salisbury-Glennon, J., Glenn, J. and Hmelo, C. 2000. 'How are we doing? Methods of assessing group processing in a problem-based learning context' in Evensen, D. and Hmelo, C. (eds.) *Problem-based Learning: A research perspective on learning interactions*. Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Forbes, H., Duke, M. and Prosser, M. 2001. 'Students' perceptions of learning outcomes from group-based, problem-based teaching and learning activities'. *Advances in Health Sciences Education* 6: 205-217.
- Gijselaers, W. 1996. 'Connecting problem-based practices with educational theory' in Wilkerson, L. and Gijselaers, W. (eds.) *Bringing Problem-Based Learning to Higher Education: Theory and Practice*. San Francisco: Jossey Bass Publishers.
- Hitchcock, M. and Anderson, A. 1997. 'Dealing with dysfunctional tutorial groups'. *Teaching and Learning in Medicine* 9: 19-24.
- Hmelo, C.E. 1998. 'Cognitive consequences of problem-based learning for the early development of medical expertise'. *Teaching and Learning in Medicine* 10: 92-100.
- Hmelo, C. and Lin, X. 2000. 'Becoming self-directed learners: Strategy development in problem-based learning' in Evensen, D. and Hmelo, C. (eds.) *Problem-based Learning:*

- A research perspective on learning interactions*. Malwah, NJ: Lawrence Erlbaum Associates, Publishers.
- Hmelo-Silver, C. 2004. Problem-based Learning: What and How do students learn? *Educational Psychology Review* 16(3):235-266.
- Holen, A. 2000. 'The PBL group: self-reflections and feedback for improved learning and growth'. *Medical Teacher* 22: 485-488.
- Legge, K., Wilkens, S. and Prosser, M. 1999. 'Monitoring student reaction to group work in science.' *HERDSA Annual International Conference*. Melbourne.
- Newble DI Clarke RM 1986. The approaches to learning of students in a traditional and in an innovative problem-based medical school. *Medical Education* 20:267-273.
- Perry, W. 1999. *Forms of Intellectual and Ethical Development in the College Years: A Scheme*. Jossey Bass Higher and Adult Education Series. San Francisco: Jossey Bass Publishers
- PROBLARC (Problem-Based Learning, Assessment and Research Centre) 2000. Workshop materials. Newcastle, NSW: The University of Newcastle.
- Prosser, M. and Trigwell, K. 1999. *Understanding Learning and Teaching: The experience in higher education*. Berkshire, UK: Society for Research into Higher Education & Open University Press.
- Ramsden P 1992. *Learning to Teach in Higher Education*. London: Routledge.
- Rice, P. and Ezzy, D. 1999. *Qualitative Research Methods: A health focus*. Melbourne, Vic: Oxford University Press.
- Savery, J. and Duffy, T. 1994. 'Problem-based learning: An instructional model and its constructivist framework'. *Educational Technology* 35: 31-38.
- Schmidt, H. and Moust, J. 1995. 'What makes a tutor effective? A structural equations modelling approach to learning in problem-based curricula'. *Academic Medicine* 70: 718-714.
- Schmidt, H.G. 1989. 'The rationale behind problem-based learning' in HG Schmidt, M.L., MW de Vries, JM Green (ed.) *New Directions for Medical Education: Problem-based Learning and Community-oriented Medical Education*. NY: Springer Verlag.
- Schmidt, H.G., De Volder, M., de Grave, W., Moust, J. and Patel, V. 1989. 'Explanatory models in processing of science texts: The role of prior knowledge activation through small-group discussion'. *Journal of Educational Psychology* 81.
- Seidman, I. 1998. *Interviewing as Qualitative Research: A guide for researchers in education and the social sciences*. NY: Teachers College Press.
- Skinner, V.J., Winning, T.A., and Mullins, G.P. 2003. 'Variations in students' perceptions of and strategies for PBL and PBL assessment tasks. Poster presented at the 3rd International Symposium on Problem-Based Learning in Dental Education, Jan 19-23, Victor Harbor, SA.
- Spradley, J.P. 1980. *Doing Participant Observation*. NY: Holt, Reinhart & Winston.
- Steele, D., Medder, J. and Turner, P. 2000. 'A comparison of learning outcomes and attitudes in student- versus faculty-led problem-based learning: An experimental study'. *Medical Education* 34: 2-29.
- Strauss, A. and Corbin, J. 1994. 'Grounded Theory Methodology: An overview' in Denzin, N. and Lincoln, Y. (eds.) *Handbook of Qualitative Research*. Thousand Oaks: SAGE Publications.
- Taylor, S. and Bogdan, R. 1998. *Introduction to Qualitative Research Methods: A guidebook and resource*. NY: John Wiley & Sons, Inc.

- Tempone, I. and Martin, E. 1999. 'Accounting students' approaches to group work'. *Accounting Education* 8: 177-186.
- Tipping, J., Freeman, R. and Rachlis, A. 1995. 'Using faculty and student perceptions of group dynamics to develop recommendations for PBL training'. *Academic Medicine* 70: 1050-1052.
- Vermetten, Y., Vermunt, J. and Lodewijks, H. 2002. 'Powerful learning environments? How university students differ in response to instructional measures'. *Learning and Instruction* 12: 263-284.
- Wilkerson, L., Hafler, J. and Liu, P. 1991. 'A case study of student-directed discussion in four problem-based groups'. *Academic Medicine* 66: S79-S81.
- Willis, S., Jones, A., Bundy, C., Burdett, K., Whitehouse, C. and O'Neill, P. 2002. 'Small-group work and assessment in a PBL curriculum: A qualitative and quantitative evaluation of student perceptions of the process of working in small groups and its assessment'. *Medical Teacher* 24: 495-501.