Techniques used by 'expert' and 'non-expert' tutors to facilitate problem-based learning tutorials in an undergraduate medical curriculum

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Background There is inconclusive debate within the literature as to whether the best problem-based learning (PBL) tutors are subject experts or not. The debate hinges on whether knowledgeable tutors are tempted to intervene too often in PBL discussions compared to non-expert tutors, and whether the latter may not be able to sufficiently challenge the students' level of understanding.

Purpose To describe approaches used by tutors in PBL tutorials and to identify differences between tutors from medical and non-medical backgrounds.

Methods The research reported in this paper was undertaken during the academic session 1999–2000 at the Univeristy of Liverpool Faculty of Medicine. A qualitative exploratory case study method was used and two PBL groups were observed. One of these groups had a medically qualified tutor and the other had a tutor from a humanities background. The focus of the observation was the discourse between tutor and students, which was analysed using a framework drawn from linguistics. Results were fed back to both the tutors and the students to check their perceptions of the interactions.

Results Analysis of the tutorial group interaction revealed that tutors from both backgrounds used similar techniques to raise students' awareness, facilitate the group process and direct students' learning. Differences were noted between the two tutors: the medical tutor set out to raise students' awareness by using questioning techniques herself, whereas the non-medical tutor expected students to question each other. The non-medical tutor was observed to facilitate the group process more often than the medical tutor.

Conclusions Qualitative analysis of spoken discourse in PBL tutorials provides valuable insights into the processes involved in PBL, thereby generating material which is useful for both training of and giving feedback to PBL tutors.

Keywords education, medical, undergraduate/ *methods; *problem-based learning; curriculum; mentors/education; England.

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Introduction

Problem-based learning (PBL), with its many and various interpretations, has been adopted as a teaching and learning method and curricular philosophy in institutions of higher education worldwide. In its 1993 document *Tomorrow's Doctors,* the General Medical Council (GMC) urged medical schools in the UK to make curricular changes, with the result that several British medical schools have adopted the PBL pathway since the mid-1990s.[1]

Barrows, who was involved in the inception of PBL at McMaster University in Ontario, Canada, anticipated that the ideal PBL tutor would be a group facilitator rather than a subject matter expert, and that the role of the tutor should be to facilitate student learning rather than to convey knowledge.[2] The University of Liverpool maintains that the role of the tutor is: 'not to teach, even if, especially if, you are an expert. Your role is to help the group to function…' (University of Liverpool: Guide for PBL Tutors). In 1997, with this in mind, the University appointed PBL tutors from a variety of backgrounds, not necessarily medical. As a PBL tutor with a background in health care (but not medicine),

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Key learning points

There is inconclusive debate concerning the benefit or otherwise of PBL tutor expertise.

It is virtually impossible to define 'expertise' in a multidisciplinary programme.

Methodology used to date has predominantly quantified student achievement against the background of the tutor.

Tutors use specific techniques during PBL tutorials with the intention of raising awareness, facilitating the group process and directing learning.

Similar techniques were used by tutors of medical and non-medical backgrounds, although some differences in emphasis were noted.

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the author wondered whether differences exist in the way that tutors facilitate PBL tutorials. Does facilitation depend on tutor expertise in the subject under study and what, if any, effect does this have on either PBL group functioning and/or the outcomes of student learning?

Literature review

The most common area of enquiry relating to desirable PBL tutor characteristics concerns the issue of whether or not the tutor should be an expert in the content matter related to the problem under study. Some argue that expertise detracts from the tutor's role of facilitator,[3] while others believe that subject matter experts who have also been trained in facilitation skills are likely to be the best facilitators.[4–9]

Inconsistencies arise throughout the debate, and it is difficult to draw conclusions from studies due to vastly differing definitions of expertise, of the expectations of the role of the PBL tutor, and of the structure and context of the PBL environment. Most significantly, methodological differences confound the evidence, making generalisation virtually impossible.

Definition of expertise

Studies that have focused on the effects of subject matter expertise in the PBL tutorial have defined experts in a wide variety of ways. One group of studies has defined expertise in terms of background training,[5,10,11] while another set of studies defines it as

tutors' self-perceived subject matter expertise.[3,12,13] A further study used advanced disciplinary training and/or research experience in the problem under study as its definition of expertise.[14]

However it has been determined, 'expertise' has been associated with the tutor's knowledge of the biological science related to the module in question, rather than to expertise in social sciences or group facilitation. Considering that the key to successful learning in PBL is said to lie in the interactiveness of its sessions[15] and effective group facilitation,[8,16] very little research has been undertaken into how best to facilitate group dynamics skills during the education of medical students.[17]

The learning environment

The structure of courses, case designs and information given to PBL tutors has also been found to vary between environments where the effects of tutor expertise have been studied. Some PBL courses organise their cases as multidisciplinary, studying biological sciences along with sociology, ethics and epidemiology. In other courses, students study one discrete area at a time. In a multidisciplinary course, such as Liverpool's, it would be extremely difficult, if not impossible, to find faculty members who consider themselves as truly expert in all aspects of the module content.

Variables and methodology

Studies that have examined the effects of PBL tutors' case-content knowledge have compared a range of variables using differing methods. The majority have quantified students' academic achievement as a function of their PBL tutors' expertise,[4,5,11–14,18,19] finding that the employment of case-content expert tutors has either no significant effect[4,12,13,18] or one that is slightly positive.[5,11,14,19] A few studies have used a qualitative method to code tutor/student interactions.[3,4,14,20]

Tutor–student interaction

Silver & Wilkerson,[3] who observed and audiotaped four PBL group tutorials in order to time and code tutor–student interactions, revealed interesting findings. They found that tutors who rated themselves as having expertise tended to take a more directive role in the tutorial, spoke more often and for longer, provided more direct answers and suggested more discussion topics. The authors concluded that tutor expertise might have deleterious effects on the process of collaborative learning, endangering the development of students' skills in active, self-directed learning.

Davis *et al.*[4,14] also observed group interactions, noting that a significantly larger percentage of time in groups led by experts was teacher-directed, whereas the greater proportion of time in groups led by non-experts was spent in student-initiated discussion. Wilkerson *et al.*[20] found that tutors who encouraged students to listen fully to each other, tolerated silence and interrupted infrequently were rated by students as more student-directed. This represents a similar finding to that of Dolmans *et al.*,[29] who found that tutors possessing skills in facilitating group dynamics were rated more highly by students.

Studies[2,3,8,10] which have attempted to expose the *quality* of tutor–student interactions reveal important and meaningful data relating to the skills and interventions a PBL tutor needs to utilise in order to enhance student-directed learning.

The discrepancies in the way that expertise has been defined, the context within which PBL occurs and the expected role of the PBL tutor combine with methodological differences to create problems in generalisation from studies to date. While we can surmise that the background knowledge of PBL tutors does have some effect on the PBL process, there is, however, a clear divergence of opinion in the literature as to the benefit or disruptiveness of tutor content-expertise on the facilitation of student learning and tutorial functioning.

The attention given to examining tutor expertise has created a literature that does little to assist PBL tutors of any background in determining effective ways of stimulating critical thinking and student-directed learning. Putting aside the problems associated with defining expertise and focusing on how tutors ought to function to promote optimum student-directed learning might produce more useful results.

The purpose of this study was to explore the domain of PBL facilitation in medical education, and to describe approaches used by tutors in PBL tutorials. Specifically, the study aimed to answer the following research questions:

1 When PBL tutors intervene in the PBL tutorial, what techniques do they use, and what effects do their interventions have?

2 How do students interpret the PBL tutor's interventions?

3 How do PBL tutors interpret their use of verbal intervention in a PBL tutorial?

Method

The most appropriate research design for this project was thought to be an exploratory case study involving observation of PBL tutorial groups. In order to reduce the distortion of the researcher's view and to increase the researcher's confidence whilst using a case study method, several forms of data collection were used to lend credibility to the conclusions reached.[22] In this study, the three viewpoints of the observer, the students and the PBL tutor were used for crosschecking purposes. By comparing the researcher's account with accounts from the other two viewpoints, it was hoped to test and perhaps revise the researcher's interpretations on the basis of more complete data.

Description of the sample

Two PBL tutorial groups were selected from a cohort of Year 2 undergraduate medical students at the University of Liverpool Faculty of Medicine. The rationale for selecting two PBL groups was that comparisons between tutors with different backgrounds could potentially be made. The tutors who agreed to participate in the study were both female and had both been facilitating PBL groups since the inception of the new curriculum, so were experienced group facilitators. Both tutors received the same tutor training sessions and study guides for the modules in question. Their educational and professional backgrounds differed, however, in that one tutor had a medical background while the other had a humanities background.

If the tutor was agreeable, students were approached and were given the opportunity to ask questions before providing written consent to participate in the study. The groups originally selected were both Year 2 groups. Unfortunately, one of the tutors was unavailable at the prearranged time, so consent was gained to observe an alternative group of hers, which was a Year 1 group. This reduced the opportunities for comparison between tutors and groups as the topics of the modules differed. However, the emergence of similarities in the techniques used by tutors of differing backgrounds with PBL groups at different stages of the course and covering different modules reprsented an unexpected but important finding of the study.

Medical students at the University of Liverpool study each case scenario over a 2-week period called a module. During each module, they meet with their PBL tutor three times. In the first session, they 'brainstorm' the case and decide on their learning objectives. In the second two sessions, they discuss and evaluate what they have learned. It was assumed that PBL tutors would be most likely to intervene in the second and third tutorials, when students report back with findings from their own self-study, so observations of the latter two sessions in each module were arranged.

The tutorials were observed and audiotaped by the researcher, which allowed for analysis of the types of verbal intervention used by the tutor and the effects of the tutor's interventions on the PBL tutorial. Tutorials were not transcribed verbatim, but all tutor comments were recorded and timed, as was the length and frequency of student discussion, along with any key student remarks and the general gist of the student discussion.

Post-tutorial interviews: tutors' and students' perceptions

The students were interviewed as a group immediately after the tutorial so that the tutorial session would be fresh in their minds. Tutors were interviewed immediately after the student interviews. The purpose of the semi-structured interviews was to crosscheck the researcher's observations of the tutorials with the students and the tutor. Prior to the tutorials, the researcher constructed an interview guide that focused on asking both the students and the tutor to identify the times that the tutor intervened, and the effect they felt that had. In addition, tutors were asked for their insights into the bases of their decisions to intervene in the tutorial.

Results

Quantitative analysis of the tutorials included timing the total length of the tutorials, and the amounts of tutorial time taken up with tutor talk, student talk and silence. Tutors' comments were divided into questions, statements and answers. Topics initiated for discussion were also counted, and it was then possible to calculate the percentages of topics initiated by tutors and students, respectively, as shown in Table 1.

Because of the rules about who speaks and when, which guide all forms of spoken discourse,[23] it was expected that certain types of initiation and response would be used during PBL tutorials, leading the researcher to conclude that analysis of who initiated discussion topics would reveal significant findings.

Development of categories

Existing categories for analysing types of teacher initiation and pupil response did not appear to fit within the PBL framework of student-directed learning. It was therefore decided not to precode tutor interventions in the tutorial but to use an inductive approach to develop categories using a constant comparative method[24] to analyse the *type* and *quality* of PBL tutor responses.

Recurring patterns and themes were identified through reading and re-reading the data and listening to the taped tutorials. The plausibility of the categories developed by the researcher were checked by comparing them with the tutors' and students' perspectives obtained in the post-tutorial interviews and with other categories drawn from linguistic research.[23,25–27]

Once the plausibility of categories was established, they were clustered according to the effects the tutors' interventions had on the PBL tutorial. This was validated through the researcher's observations of the PBL tutorials and crosschecked with the students as to what effects they felt the tutors' interventions had.

Results are summarised in response to the three research questions.

Table 1 Quantitative measures of one PBL tutorial

	Tutor A (medical background)	Tutor B (non-medical background)
Tutorial length	68 min 52 sec	64 min 10 sec
Number of tutor comments	$n = 79$	$n = 34$
Questions (% of total tutor comments)	44 (55·7%)	17 (50%)
Statements (% of total tutor comments)	34 (43%)	12 (35·3%)
Combined questions and statements (% of total tutor comments)	1 (1·2%)	5 (14·7%)
Answers	0	0
Silence	15 s	46 s
Total tutor talk (% of total tutorial time)	15 min 26 sec (22·3%)	3 min 3 sec (5·1%)
Topics initiated by students	$n = 17$	$n = 16$
Topics initiated by tutor	9 (52%)	2 (12·5%)

Percentages do not add up to 100% because of rounding

When PBL tutors intervene in the PBL tutorial, what techniques do they use, and what effects do their interventions have?

Data analysis revealed that the PBL tutors in this study were found to use various techniques, categorised and defined as shown in Table 2.

The effects of the techniques shown in Table 2 were observed and then discussed in the post-tutorial interviews. The following examples reveal that raising students' awareness was seen by both tutors to be a function of the PBL tutorial. However, the medical tutor felt it was her role to raise students' awareness, whereas the non-medical tutor considered it was more appropriate for the students to question one another.

'Yes, I really just want to raise awareness, put it out there and I think they thought about something which they wouldn't otherwise.' (Medical tutor interview 1)

'The other reason I do tend not to say much in this group is that they do question each other. Within the first two sessions, I started saying, "You have to ask each other," and I stress that I don't know the answers. "I can't tell you if you're wrong so you have to challenge." I think that if they know that there isn't an option, they do seem to question each other.' (Humanities tutor interview 1)

The students in the medical tutor's group confirmed that the tutor's interventions had the effect of making them think about something in a new way.

'It made me think about things I wouldn't otherwise have thought of.' (Student interview A1)

Evidence from the post-tutorial interview with group B, which had the humanities tutor, revealed that the students saw the tutor's primary role as facilitating the group process.

'She kept us on track, didn't she, whenever we wandered, she's always there … because we are such time-wasters.' (Student interview B1)

The humanities tutor confirmed that she believed an important part of her role was to keep the students 'on track'.

'Certainly one area would be when they go off on tangents just to pull them back to what they're doing.

Table 2 Techniques used by PBL tutors

Elicitation	Elicitation always involved the tutor asking a question, in most cases generally to the group as a whole, but occasionally by directly questioning one student; an elicitation was an event that required a verbal response from the students
Re-elicitation	Re-elicitation was an event where the tutor repeated the same elicitation, or rephrased it; a re-elicitation required a verbal response from the students, and indicated that the previous response given was inadequate in some way
Prompting	Prompting was a technique used to gather more information, or to get the students to expand on something they had not fully explained
Refocusing	When the students were wandering off the subject, or dwelling on a minor point, the tutors used re-focusing to bring the students back to the topic or the case scenario
Facilitating	Facilitating occurred when the tutor guided the students in a certain direction, suggested what to do next, or attended to group dynamics
Evaluating	Evaluating refers to comments made by the tutor to evaluate the group process, or to evaluate individual students
Summarising	Summarising refers to the tutor summarising a section of discussion; this usually signalled the closing of one topic before the group moved on to the next
Giving feedback	Giving feedback occurred when the tutor confirmed that she had heard or seen an appropriate response
Informing	Informing occurred when the tutor passed on facts, information, opinions or ideas; giving information did not require a response from the students
Directing learning	Directing learning refers to the tutor giving a direct message about what students should be learning

It might be that they're going off onto a tangent that's relevant, or it can be turning into what we were doing last night. So it can be either of those, but yeah, just keep them on track.' (Humanities tutor interview 1)

Tutor A, who had a medical background, tended to use informing and directing learning more frequently than the non-medical tutor, which, as she indicated in a post-tutorial interview, created a conflict between the expected role of the PBL tutor and her own beliefs about student learning.

'It's not my role to tell them to go and look it up…[laughing] but I did tell them to go and look it up. It's not the detail, to a certain extent what they choose to learn is their decision, their objective setting, but to totally ignore that there is a body of literature out there that they're not accessing, I think is a problem.' (Medical tutor interview 2)

The terms 'informing' and 'directing learning' were not used by the students with reference to the expected functions of their tutor. One student, in fact, considered it beneficial that the non-medical tutor did not have content knowledge.

'I think that's the thing because she hasn't got a lot of physiological or anatomy understanding because that's not what she's done, so it helps because she leaves us to figure that out ourselves, then she knows what we should be doing and if we don't do it, she tells us.' (Student interview B1)

Three main categories of PBL tutor interventions were thus identified (Table 3). These were: *raising awareness*, *facilitating the group process and directing learning*.

Analysis revealed differences between the two tutors in terms of the categories of interventions they used (Table 4).

Discussion

Tutors predominantly used questions (50–55.7% of tutor comments) to achieve the aims of raising awareness and facilitating the group process. Neither tutor gave any answers during the observed tutorials. This compares with one study which found that 9–38% of tutor contributions consisted of questions,[20] and another which found that 31–42% consisted of -answers.[3] These authors do not elaborate on the kinds of comments or questions used by tutors in their studies.

In this study, tutors' questions had different effects, but it was particularly notable that questions that elicited more information from students seemed to raise their awareness. This fits with Barrows'[2] belief that it is

Table 4 A comparison of types of tutor interventions used by PBL tutors from different backgrounds

	Tutor A (medical background)	Tutor B (non-medical background)
Raising awareness	$n = 38$ (48.1%)	$n = 13$ (38.1%)
Facilitating group process	$n = 32$ (40.5%)	$n = 19$ (55.9%)
Directing learning	$n = 9$ (11.4%)	$n = 2$ (5.9%)

Figures in brackets indicate percentages of total tutor comments
Percentages do not add up to 100% because of rounding.

Table 3 Effect of PBL tutor interventions

Raising critical awareness	Exchanges which included *elicitation, re-elicitation* and sometimes *prompting* were used by the PBL tutor in response to inadequate explanation, gaps in students' knowledge, or inconsistencies in their thinking. The effect of this technique was to expand the group discussion on to a higher cognitive level
Facilitating the group process	Exchanges which included *facilitating, refocusing, summarising, feedback and evaluation* were used in response to students going off the topic, or to maintain group dynamics. They had the function of keeping students on task and focused on their learning objectives or the scenario, and ensuring that the group process flowed well
Directing learning	Events which included *informing* or *directing learning* were used infrequently. These interventions effectively blocked a line of discussion, signalling an end to the students' discussion of a topic. No response was required from the students

the function of the PBL tutor to raise students' levels of thinking to a 'metacognitive' or higher cognitive level. Brookfield & Preskill[28] suggest that using open-ended questions which ask for more evidence or for clarification are *'more likely to provoke student's thinking and problem-solving abilities and make the fullest use of discussion's potential for expanding intellectual and emotional horizons'* (p.69).

The present study confirms the significance of who initiates topics for discussion, with 52% of topics initiated by the medical tutor and 12·5% by the non-medical tutor. These findings are similar to those of Silver & Wilkerson,[3] who found that expert tutors suggested 69% of agenda items and non-experts suggested 11%.

Giving information and directing what students ought to be learning had the effect of blocking students' discussion. This was used infrequently (5·8–11·4% of tutor comments) by either tutor in this study, compared with a University of Michigin study which found that 10·2–15·5% of discussion was teacher-directed.[14] In this study, the predominant exchanges were student–student, which, according to Wilkerson *et al.*,[20] is an indicator of student-directed learning.

How do students interpret the PBL tutor's interventions?

Students positively appreciated the qualities that both PBL tutors brought to the tutorials. In the case of the medical tutor, students recognised that she raised their awareness by asking them questions that made them think about things they would not otherwise have thought about. In the case of the non-medical tutor, student comments focused on the tutor's role of keeping the group 'on track' and the fact that her lack of medical qualifications meant that they were compelled to question each other and check things out themselves. This finding is similar to that of Dolmans *et al.*,[29] who rated PBL tutors with group facilitation skills more highly.

How do PBL tutors interpret their use of verbal intervention in a PBL tutorial?

Tutors emphasised different aspects of their role as being important. The medical tutor particularly emphasised that she wanted to raise students' awareness: getting students to think about something differently was one of her aims. The non-medical tutor emphasised that an important part of her role was to keep students focused on the scenario and their own learning objectives.

An initial finding in this study was that tutors from different backgrounds base their decisions on when and how to intervene on different foundations. The medical tutor was more influenced by her personal experience of the skills newly qualified doctors need to function as house officers. The non-medical tutor was more influenced by her past experience with PBL groups, the students' own learning objectives and faculty objectives. This finding contradicts that of Davis *et al.*,[4] who found that giving tutors of all backgrounds more case-specific information reduced the effects of tutor expertise. The present study indicates that having specific case-content knowledge is not the key factor in influencing a PBL tutor's decision to intervene. Rather, it is affected by the tutor's past experience, whether that is personal experience of the professional environment that students will be entering, or previous experience with PBL groups.

Whether students are capable of challenging each other or not was viewed differently by the two tutors in this study. The medical tutor felt that critically challenging each other was not something students automatically knew how to do. She saw the raising of the students' awareness to be an important part of her role and she intended to model critically challenging responses in order to achieve this. The non-medical tutor did expect students to challenge each other. She reinforced to them the point that as she did not know the answers, they would *have* to question each other. This raises an important issue of when and how students learn to critically challenge each other, and whether it detracts from student-directed learning if the tutor fulfils this function.

Facilitating the group process was an attribute seen more frequently in the non-medical tutor's tutorial group. Not having the content knowledge appeared to help the tutor to be more facilitative: she *had* to ensure that the group functioned well, that the students kept on task and met their own learning objectives. This raises the issue of whether having content knowledge can hinder the tutor, insofar as having the knowledge means the tutor falls back on it rather than ensuring that the group process operates sufficiently well to facilitate student-directed learning.

Limitations of the study

A number of factors limit the generalisability of this study. The presence of the observer and the audiotape can influence the group's behaviour in ways that cannot be controlled. Both the students and tutor in the Year 1 group confirmed that they were not as spontaneous as they usually were.

Transcription of the tape recordings was incomplete in that only a summary of main ideas presented by the students was transcribed, thereby introducing the researcher's bias and interpretation of what was said.

Consideration must also be given to the fact that the two groups were clearly incomparable and that an unrepresentative segment of behaviour might be observed in the PBL tutorials. No PBL group can exist independently of the cultural influence of the university it belongs to and the group's microculture.[30] The influence of culture cannot be seen through one or two group observations. It is with such limitations in mind that conclusions are drawn.

Conclusions

Bearing these limitations in mind, interesting similarities and differences between the two tutors were observed. Similarities were observed in the kinds of tutor interventions used by both tutors to *raise students' awareness,* to *facilitate the group process and* to *direct student learning.* Differences included the facts that the medical tutor spoke more frequently, initiated more topics for discussion, and used techniques to *raise awareness* more often than the non-medical tutor, whose greatest number of interventions fell into the category of *facilitating the group process.*

Discourse analysis indicates that, although the medical tutor spoke more often, she raised students' awareness more often than the non-medical tutor. In contrast, the humanities tutor expected students to challenge each other and used group facilitation techniques more often.

This study attempted to resolve some of the definitional and methodological difficulties encountered by previous researchers. The use of a qualitative technique to observe PBL groups and identify emerging themes begins to illuminate the techniques employed by PBL tutors to raise students' awareness and facilitate the group process; this represents an important key to understanding the facilitation of PBL tutorials.

Contributor

AG is currently a lecturer in midwifery at Auckland University of Technology. From 1997–2000, she was employed as a PBL tutor at the University of Liverpool, UK, where this study was conducted.

Acknowledgements

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