

Question-Asking Patterns during Problem-Based Learning Tutorials: Formal Functional Roles

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ABSTRACT

Question-asking is essential for being, knowing and learning. However, classroom research has confirmed that students do not ask questions spontaneously and teachers ask the most questions, mainly low-level ones. The purpose of this qualitative case-study is to investigate question-asking during problem-based learning (PBL) tutorials, a subject rarely studied. By filling this gap, this study, based on video-recorded data from 20 small-group tutorial sessions, provides fresh perspective and contributes to the field by focusing on formal functional roles. The analysis reveals that despite the high incidence of questions, they are imbalanced regarding their type and who asks them. The study confirms that students do acquire the skill of question-asking during PBL tutorials. However, to maximize the benefits of question-asking for epistemological and ontological development, more innovative learning activities must be designed and realised in tutorials.

Keywords: Question Asking; Tutorial; Problem-Based Learning (PBL); Formal Functional Role; Physiotherapy

INTRODUCTION

A question may be the first indication of border crossing (Marbach-Ad & Sokolove, 2000). That is, asking a question can be a significant step toward an unfamiliar area that potentially expands and deepens one's being, professional becoming, knowing, learning and understanding. In the educational context, there has been more than a century of scientific research on question-asking, from Stevens (1912) through Gall (1970) and from Carlsen (1991) to Pedrosa de Jesus et al. (2012) and many more. However, the focus mainly has been on i) primary and secondary rather than higher education, ii) teachers' rather than students' questions, iii) research designs that focus on either teachers' or students' questions rather than

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on both and iv) classroom as a context rather than other pedagogical settings, such as small-group work. Interestingly, previous research has identified that question-asking has a paradoxical status in classroom-based education. It is a valued, although not always a welcome, activity (Chin & Osbourne, 2008). This means that there is the desire to use questioning to spend more time aiding students' explorations. Yet, there is pressure to cover a certain amount of curriculum content in a given time. Particularly, it is students' questions that are not welcomed, either by teachers or other students, because they may disrupt the smooth running of the lesson and steal time from covering prescribed content and preparing for tests. Given this, it may be argued that students do not learn how to ask questions in the classroom context.

Despite vast research on problem-based learning (PBL) during the last four decades, question-asking has received very little attention. Questions as learning issues have been studied within PBL (e.g. Abrandt Dalhgren & Öberg, 2001). Yet, what actually happens, what kinds of questions are asked, and by whom, during tutorials, has been studied very little. This is quite surprising. Only a few PBL tutorial studies have focused entirely (e.g. Chin & Chia, 2004) or partially (e.g. Hmelo-Silver & Barrows, 2008) on question-asking. Recently, Zhang et al. (2010) advocated the need to build a sensitive questioning framework for PBL.

The purpose of this research is to investigate question-asking during tutorials based on students' formal functional roles, such as that of discussion leader. Broadly, a role can be considered a recurring pattern of behaviour. However, formal functional roles differ from informal roles, such as 'cynic'. That is, informal roles are emergent, they simply happen, often to serve the needs of personality. In contrast, group members are assigned formal functional roles (Mudrack & Farrell, 1995). To date, PBL tutorial studies have focused intensively on the role of tutor (e.g. Abrandt, Castensson & Dalhgren, 1998; Maudsley, 1999; Hendry, 2009; Connelly & Silén, 2011) from various perspectives, such as helping tutors to ask more good, open-ended questions (Azer, 2005); to give voice to meta-cognitive questions (Downing et al. 2009); or to monitor leadership profiles during group work (O'Shea et al., 2013). Only a few studies (e.g. Duek, 2000) have paid attention to students' informal roles, such as 'discussion dominator'. Yet, to the author's knowledge, no previous PBL tutorial study has focused on question-asking from the perspective of students' formal functional roles, even though they are used very commonly, particularly in Europe. These roles are designed to support small-group work rather than to act as a straitjacket (Barrett, 2005a). The main idea is that small-group work consciously is as effective, goal-oriented and systematic as possible. Transparency of the procedure is assumed to prevent a group from beginning aimless discussions, asking random questions and raising the cognitive load too high. Yet, currently, we know very little about students' formal functional roles and their effects on question-asking during tutorials. The aims of this study are to fill this gap and to answer the following research questions.

1. *What types of questions are asked during a PBL tutorial?*

2. *What types of questions are asked by tutors and by students with and without formal functional roles?*

A tutorial of small-group work, often guided by a tutor, is considered to be at the heart of PBL (Singaram et al., 2010). The tutorial is believed to provide opportunities for students to discuss, debate and ask questions. This is assumed to lead to deeper understanding (Visschers-Pleijers et al., 2005). Nevertheless, a number of PBL studies have found evidence of dysfunctional tutorial groups (e.g. Hak & Maguire, 2000; de Grave, Dolmans & van der Vleuten, 2002; Henry, Ryan & Harris, 2003; Moust, van Berkel & Schmidt, 2005; Kindler et al., 2009). For example, from the perspective of question-asking, Willis, Jones, Bundy, Burdett, Whitehouse and O'Neill (2002) concluded that when group performance is poor, there is little prominent questioning. There is a danger that tutorial sessions become fruitless because of inappropriate questions, rendering PBL ineffective.

From the perspective of potential barriers to question-asking, three meta-questions can be identified. The first appears to be how much one needs to *know* in order to ask proper questions. Often, there is an assumption that questions are asked when someone does not know or is ignorant. However, Miyake and Norman (1979) prefer the view that an optimal amount of knowledge is needed for asking questions: Knowing too much or too little can be counter-productive to asking questions. Good et al.'s (1987) study supports this view by showing that middle achievers ask the most questions. In contrast, Molinero and Garcia-Madruga (2011) take the view that more knowledgeable people ask more questions. This idea is based on Loewenstein's (1994) gap theory about curiosity, which states that when a person knows a little, then attention is focused on what s/he knows, but when s/he knows a lot, attention is focused on what s/he is ignorant of.

The second key meta-question is how one needs to *feel* in order to ask appropriate questions. Watts and Pedrosa de Jesus (2005) point out that asking questions in an open forum can heighten tensions, such as between self-assurance and self-doubt. Asking questions can be difficult when feelings of aversion, distaste, embarrassment, exposure, vulnerability or distrust are strongly present. For this reason, question-asking may be hindered or even completely frustrated. Sometimes, staying silent appears to be a better option to students than taking the risk of asking a question that may seem to be 'stupid'.

In addition, question-asking is an ontological issue (see, e.g. Socrates and Plato), paying attention to being and becoming, rather than just an epistemological or emotional issue. The third key meta-question is how one needs to *be pedagogically* in order to ask appropriate questions that may support students' pedagogical being now and professional becoming in the near future. In a sense, students' questions can be considered their voices. For instance,

according to Batchelor (2006), there are three student pedagogical-voice situations: i) *recovering* implies that the student voice was there but has been suppressed, ii) *uncovering* implies that the voice has had difficulty in being heard and iii) *discovering* suggests the possibility of a voice that is waiting to emerge. In the higher-education context, Barnett (2007, p165) argues that in an age of uncertainty, a student's being and becoming is more significant than his/her efforts to know and '*should occupy her teachers' primary attentions*'.

Recently, Pedrosa de Jesus et al. (2012) emphasised that question-asking is highly context-dependent. They illuminated this by presenting two broad, polarized contextual zones for producing and receiving students' questions. Zone 1, with high formality, is dominated by teacher questioning, and students' questions are infrequent, routine information-seeking. This zone is filled with unequal relationships between students and teacher. In this zone, few students have the skills and confidence to raise questions. Zone 2, with low conformity, is largely learner-focused, attempting to avoid 'epistemological distance' between experts and novices in relation to their knowledge and abilities. In this zone, students operate in groups with equal power among members. That is, authority is not rotated on any basis or shared among group members. However, Pedrosa de Jesus et al. (2012) remind us of the brutal reality: Intentions do not equal implementation. Hard work is needed to enhance the shift to a Zone 2 questioning context. For this reason, students should be led to develop the abilities, confidence and opportunities required to ask questions.

In the context of questioning, PBL tutorials tend to be closer to Zone 2 than to Zone 1. Generally, PBL tutorials offer students plenty of opportunities to ask questions and, thus, potentially to overcome some of the main, known barriers to question-asking. More specifically, in a PBL tutorial, one can build a favourable set of circumstances for recovering, uncovering or discovering one's own voice, supporting it and allowing it to flourish. This can be done by offering students and tutors opportunities to try various voices through various formal functional roles. At the moment, the use of formal functional roles appears to be very popular in some European countries. For example, in Ireland, students use such roles as *chairman*, *scribe*, *timekeeper*, *reader of problems* and, sometimes, *presentation editor* (Barrett, 2005a). In the Netherlands (Heijne, 2001), students use such roles as *chairman* and *minutes secretary*. In Finland, students use such formal functional roles as *discussion leader*, *recorder* and, sometimes, *observer* (Öystilä, 2006).

Main tasks vary by formal functional role. For example, in Finland (see e.g. Alanko-Turunen, 2005), the *discussion leader* generally maintains the flow of communication by encouraging participants, by giving everyone the opportunity to share their views and by monitoring the time. The *recorder* writes down the key points of discussion, which later are made available to all group members. The *board recorder* often is an assistant to the recorder and records the discussion on a blackboard or flip chart, perhaps by using mind mapping, which helps gain an overview of what has been discussed. The *observer* often is a silent member who secretly

decides what to pay attention to and gives feedback, often personally and to the whole group, immediately after the session. The *tutor's* main task is to bring out the best in the group by being sensitive to group dynamics, difficulties and discussions that are too superficial. However, the role of tutor has been recognised as very complex (see e.g. O'Shea et al., 2013).

METHOD

Research context

This research is a qualitative case study (Yin, 2003) of an experienced, higher-education PBL institution in Finland: the Bachelor of Science degree program in physiotherapy at Pirkanmaa Polytechnic (now Tampere University of Applied Sciences). This institution has been designed based on the generally agreed-upon, main characteristics of PBL: i) problems as a starting point for learning, ii) small-group collaboration, iii) guidance from a tutor, iv) limited number of lectures, v) student-initiated learning and vi) enough time for self-study (see e.g. Schmidt et al., 2009). This institute was the second PBL institution to be formed in Finland, in 1996. It adopted a whole-PBL curriculum strategy and uses a modified cyclical tutorial model (see Poikela & Poikela, 2006, p78) with fixed formal functional roles of discussion leader, recorder and observer. In this institution, all students are trained in use of formal functional roles when they begin their studies. The training period is a few weeks, but it takes place alongside rather than separately from their studies. In addition, all students know beforehand who will play a certain role in a certain session, since they take turns in the roles. That is, a student may be a discussion leader in the opening session and a recorder in the closing session. This role rotation allows all students to play at least one, and often many, formal functional roles with the same small group. Of course, this is dependent on the length of time the group will collaborate as an entity. In this institution, groups are short term. That is, after each study-block, which lasts a few weeks, members of a group are reorganised. In addition, small groups consist of approximately eight members and one tutor. Often, tutorial sessions are held twice a week, and each session lasts about one hour and 45 minutes. In this institution, there is no fixed number of tutorial sessions per problem; they vary from two to four.

Participants

Study participants included 6 experienced female tutors (5 of whom have been tutors since 1996), and 55 students, 46 female and 9 male. These participants formed seven small groups (see Table 1). Note that one tutor guided two groups during data collection. More specifically, 3 groups were from the first study-year and accounted for 25 students; 2 groups were from the second study-year and accounted for 16 students and 2 groups were from the third study-year and accounted for 14 students. Thus, students varied in PBL experience depending on their study-year. All students were Finns; most were about 25 years old.

Table 1. Collected video and audio data

Groups	Study-years	Sizes	Problem formats	Sessions n = 20	Times	Questions n = 2306
1	1	8 + tutor	Short text	3	3 hr. 12 min.	397
2	1	10 + tutor	Series of photos	3	3 hr. 40 min.	347
3	1	7 + tutor	Series of drawings	4	4 hr. 45 min.	666
4	2	7 + tutor	Video (10 min.)	3	2 hr. 50 min.	303
5	2	9 + tutor	Drawing with words	2	2 hr. 25 min.	253
6	3	7 + tutor	Series of photos	3	3 hr. 58 min.	283
7	3	7 + tutor	Video (8 min.)	2	1 hr. 15 min.	57

Data collection

Data were collected by audio and video recording the tutorial sessions of seven small groups. Each group was recorded while tackling one problem. However, this could mean one opening session and one, two or three closing sessions per problem, since the number of sessions per problem varied. For video recording, guidelines from Derry's (2007) study were adapted. Only one camera was used to collect data; therefore, some parts of the rooms and the faces of some participants were not recorded visually. To overcome this limitation, audio recording was used to ensure that everything said by participants was recorded. After each session, participants were asked how they felt about the presence of the camera and the author in the room. Their answers were always the same: They had forgotten that the author was in the room with the video camera.

Groups were selected based on a purposive sampling strategy. The main criteria for selecting a group were i) the format of a problem representation and ii) the study-year, since every group was about the same size and was supposed to use the same cyclical tutorial procedure and the same formal functional roles. Thus, there were at least two of the same kind of problem representation format, such as video, and at least two groups from the same study-year. Nevertheless, this study did not pay specific attention to the impact of study-year or problem representation format. The study consisted of 20 sessions, including 7 opening and 13 closing sessions. The study recorded approximately 22 hours of data over about 2 years.

Before data collection, the author spent about one month observing tutorial sessions from three experienced PBL institutions at Tampere, Finland. The main reason for this was to become familiar with PBL tutorial procedure. At the same time, the author participated in a training programme, 'Problem-Based Learning and Professional Development (PBL-PD)', organised by the Eduta Institute. The main reason for participation was to act as a group member in PBL-tutorial sessions.

After one month of observing the training, which would continue for two more years, the author selected the Bachelor of Science degree studies in physiotherapy at Pirkanmaa Polytechnic (now Tampere University of Applied Sciences) as the study site. The main reason for this selection was lack of further data-collection access at the two other institutions. However, the selected institution was very open and willing to contribute to the research. In addition, it used the same PBL tutorial model as used in the PBL-PD training. After selecting the institution, the author was assigned a contact person to ask for further information. In addition, the author received a list of tutors, who were contacted by e-mail and asked for their course timetables to enable arranging data collection.

Content analysis procedure

All video- and audio-recorded data were transcribed verbatim for the purpose of content analysis (Cohen, Manion & Morrison, 2007), a time-consuming process. First, all recorded data were watched several times without any notes being taken. Second, all data were re-watched, and notes were taken. Third, all data were transcribed verbatim, beginning with the audio recordings. Then, accuracy of the transcriptions were double-checked and missing parts were filled in from the video recordings. Fourth, accuracy of transcription was checked by watching all the video recordings. Fifth, the author began to pay attention to questions, identifying them based on grammatical form or rising intonation. All questions asked were marked in the transcript with coloured pen. Sixth, the author began to pay attention to who was asking the questions, marking all questions with various coloured pens based on who was asking the question. The tutor, discussion leader, recorder, board recorder, observer, and each student with any role got a dedicated colour or colour-combination. Seventh, the author focused on what kinds of questions were asked and by whom, noticing that a significant number of questions concerned the PBL tutorial procedure, but also that there were very few off-topic questions. Then, the author began focusing on on-topic-questions, not at all easy. There seemed to be many ways to categorise this kind of question. Finally, on-topic questions were categorised based on degree of challenge to conceptual understanding. These question categories were named *confirmation* and *transformation*.

The outcome of content analysis comprised four broad but specific-enough categories of questions: *confirmation*, *transformation*, *group process*, and *irrelevant*. The intention was not to test existing categories with video-recorded data, but to observe as openly as possible what kinds of questions students and tutors ask during PBL tutorial sessions. Categorisation can be a sensitive framework that can help in understanding more profoundly what is happening regarding question-asking in PBL tutorial sessions.

RESULTS WITH DISCUSSION

As mentioned earlier, this study attempts to answer the following research questions.

1. What types of questions are asked during PBL tutorials?

2. What types of questions are asked by tutors and by students with and without formal functional roles?

To thoroughly understand question-asking during a PBL tutorial, one must investigate the various types of questions asked. However, this is insufficient because question-asking may vary greatly depending on *who is asking* during the PBL tutorial. Therefore, this study focuses on what types of questions are asked and by whom. This provides a clearer picture of question-asking.

Based on content analysis of video-recorded data, four broad categories of questions were identified: confirmation, transformation, group process, and irrelevant. Table 2 lists the categories with descriptions and examples.

Table 2. Categories of identified questions with class types, descriptions and examples

Question types	Descriptions	Examples
Confirmation	Checking hearing or understanding	'What was the word you said?' '...was it like this?'
Transformation	Challenging understanding	'But is aging only a negative issue?' 'But why does blood flow like that?'
Group process	Monitoring or activating group work	'Shall we move to the next...?' 'Does anyone have anything to say?'
Irrelevant	No direct topic and process connection	'Did you get a haircut?' 'Where did I put my pen?'

Table 3 shows results about the types of questions asked and by whom. Percentages are rounded.

Table 3. Types of questions asked by formal functional role and no role

	Confirmation n = 1018	Transformation n = 616	Group process n = 634	Irrelevant n = 38
Role				
Tutor	7	26	15	8
Discussion leader	18	21	44	21
Recorder	11	7	8	8
Board recorder	10	4	13	5
Observer	2	1	1	3
No role student	52	41	19	55

Few *irrelevant questions* (n = 38) were asked during PBL tutorials. The actual percentage is approximately 2%. This shows that groups were focused on the task(s) at hand. This finding of high task involvement is in line with the findings of de Grave, Boshuizen and Schmidt (1996) and Visschers-Pleijers et al. (2006). In addition, a study by Chia and Chin (2004)

showed that questions raised in groups generally were topic-specific, not broad nor unfocused.

One explanation for the above seems to be successful problem design. Appropriate problem selection and design has been identified as a key success factor (e.g. Hung, 2009, 2011; Schmidt, Rotgans & Yew, 2011). Another explanation could be that time constraints in each session make tutor and students less tolerant of off-topic discussion and questions. A third explanation may be that following a pre-set PBL tutorial procedure, such as ‘seven-jumps’ or ‘cyclical tutorial model’, provides clear focus points, minimizing off-topic questions.

About 27% of the total questions asked were *group process questions* (n = 634). This result points out that groups needed to ask group process questions and is in line partially with results of previous studies. Hmelo-Silver and Barrows (2008) found that meta-questions, for example, those about learning process monitoring and group dynamics, account for 50% of all questions. Interestingly, in their study, students (41%) asked far fewer meta-questions than the tutor (75%). In the current study, discussion leader(s) (44%), not tutor(s) (15%), asked most of the group process questions.

One explanation may be that, regardless of training, those not familiar with PBL tutorial procedure, such as first study-year students, still need to ask group process questions. This can happen when there are pre-set phases and formal functional roles that are new to the students and to some tutors, too. Another reason might be that three weeks of training might not be enough for students and tutors to gain profound understanding of PBL procedure. A final reason could be that those students with formal functional roles, in particular, need to focus more on group processes to be able to handle the role and the tasks involved in it. In this study, students with formal functional roles asked more than half (66%) of the group process questions.

Results show that *confirmation questions* (n = 1018) dominated question-asking during PBL tutorials, accounting for approximately 44% of all questions (n = 2306). The dominance of confirmation questions may be a warning sign, particularly if the main aim of the PBL tutorial is constructing knowledge collaboratively, including questions that challenge current understanding, and achieving deep learning with epistemological development. More specifically, students asked almost twice as many confirmation questions as transformation questions. In contrast, tutors asked many more transformation (26%) than confirmation (7%) questions. This complementary performance between tutors and students differs from results of a previous study by Profetto-McGarth et al. (2004), in which both students and tutors asked mostly low-level questions, such as yes/no questions, thereby mimicking, rather than complementing, each other. In addition, Hmelo-Silver and Barrows’ (2008) study does not fully support the phenomenon of complementary performance between tutors and students. In their study, both students and tutors asked numerous long-answer questions, but the tutors

asked far fewer short-answer questions than students did. Furthermore, they found that questions requiring short answers were asked three times more often than those requiring long answers. Even though short-answer questions and confirmation questions are not necessarily the same kinds of questions, they still give a picture of where question-asking is focused.

One explanation for the dominance of confirmation questions over transformation ones is the tutor's guiding style. It is well known that tutors have difficulties handling their multiple roles (e.g. O'Shea et al., 2013). It is encouraging that tutors are seen as role models in emphasising transformation questions over confirmation ones. On the other hand, there is a risk that students rely too heavily on tutors to ask important transformation questions. The tutorial may be less effective when the focus is on confirming rather than transforming conceptual understanding. Therefore, students need to be reminded about the importance of the tutorial to enhancing *deep learning*. For this reason, students must listen to each other more carefully than they currently appear to do. This could decrease the incidence of confirming questions asked to check potentially misheard information, such as, 'What was the word you said'? As a result, the group could focus on challenging members' understanding rather than on repeating what was said a minute ago. This could increase the depth of reasoning. Currently, only discussion leaders and tutors ask more transformation question than confirmation ones. Taking on the role of recorder, board recorder or observer seems to be counter to increasing the depth of reasoning.

However, questions often have specific purposes. For example, confirmation questions are not necessarily less valuable than transformation questions (see, e.g. Pedrosa de Jesus, Teixeira-Dias & Watts, 2003). There may be a greater urgency for students to check their own understanding than to challenge it. In addition, tutors might need to assure that students have understood certain issues by asking yes/no questions (Profetto-McGarth et al., 2004) or short-answer questions (Hmelo-Silver & Barrows, 2008). Furthermore, some students may be at a stage of epistemological development that places greater emphasis on accepting rather than challenging existing knowledge or understanding (see, Perry, 1970; King & Kitchener, 1994; Hofer & Pintrich, 1997). In this respect, they may be closer to absolutists than evaluativists (Kuhn, 2005, p31). It may be possible to find an optimum balance between confirmation and transformation questions that will lead to optimal learning processes and outcomes without sacrificing deep learning. This would support students' epistemological development, pedagogical being and professional and other types of becoming.

Limitations

There are some research limitations that must be considered. First, data were collected from only one northern-European country, and from only one experienced PBL institution. In addition, data were collected from only one discipline, physiotherapy, which used only one type of PBL tutorial model, called a cyclical model. Furthermore, data were collected only in face-to-face sessions, not from synchronous or asynchronous online sessions. Moreover,

content analysis was used, while, for example, conversation analysis might have revealed different results. Finally, questions were identified based on grammatical form or rising intonation, which might have excluded questions that combine more functional and sequential dimensions.

CONCLUSION

Results of this study suggest that formal functional roles in the PBL tutorial procedure can change the paradoxical status of question-asking, which is that students ask questions during small-group work, but tutors ask far fewer questions than students. A PBL tutorial can be regarded as a democratic approach that values and welcomes students' questions. Students become more active in asking questions in PBL tutorials when in a formal functional role, particularly the role of discussion leader.

However, we can identify patterns of question-asking in PBL tutorials that have clear connections to specific formal functional roles. Each formal functional role prefers certain kinds of questions over others. For example, discussion leaders are very active, but ask mostly group process questions, while recorders ask fewer questions than discussion leaders but ask mostly confirmation questions. In addition, board recorders ask fewer questions than discussion leaders and ask mostly group process and confirmation questions. Observers, as silent group members, ask no questions. Students without any formal functional roles ask mostly confirmation questions and some transformation questions, but significantly fewer group process questions. Tutors ask mostly transformation questions and considerably fewer confirmation and group process questions.

There is positive side to these question-asking patterns based on formal functional roles. These patterns make the PBL tutorial process more visible, more predictable and, perhaps, easier for all to participate in it. Participation can be activated by specific roles and their associated tasks and responsibilities. Cognitive load can be reduced when students know where to focus based on certain roles. This can be beneficial for developing students' skills and knowledge by engaging them in pedagogically designed activities, procedures and advanced roles. Thus, the learning process can become more effective by using roles and specific tasks.

However, at the moment, those formal functional roles in use are highly rigid types, such as discussion leader/chairman and recorder/secretary. Admittedly, they may be beneficial for developing some skills, such as leadership, documentation and presentation. However, do they effectively motivate students to ask the transformative questions that are needed for deep understanding and profound reasoning? In many cases they do not. Tutors still ask many more transformative questions than either no-role students or students with formal functional roles, with the exception of discussion leaders. This study concludes that students often neglect

transformation questions, which challenge their prior knowledge and demand deep reasoning and open horizons. The question is: How must the PBL tutorial system be designed to increase the number of transformative questions asked by all students?

Firstly, offering enough *time*, more than two hours per session, could increase the opportunity for asking and handling more transformative questions. Some students might not ask transformative questions because, based on experience, there is not enough time to focus on them. Secondly, optimising the *size* of group. Too large groups, more than ten, might prevent asking transformative questions. Students that are shy might be not heard in large groups or the space is takeover by much more active students. Thirdly, *designing problems* that really are ill-structured or wicked. Well-structured problems might not evoke curiosity and challenge prior knowledge as ill-structured or wicked problems do. Fourthly, focusing on *multidisciplinary* nature of teams and problems. Designing *new* formal functional roles could effectively promote more and relevant transformative questions. They may, for instance, represent professionally important stakeholders' values, interests and priorities like in multi-disciplinary teams. For example, nursing students may be required to tackle a problem concerning a broken leg. However, instead of taking on the roles of discussion leader, recorder and so on, one student acts as a member of an ethical board, a second student acts as a nurse, a third student acts as a doctor and so on. What is different about this 'casting'?

Firstly, this working-life-meeting mode now represents a more multi-professional team meeting. Secondly, the nursing students learn how to systematically tackle a problem from multiple stakeholders' perspective, which is crucial for a given profession. Thirdly, it ensures that students tackle every problem multi-dimensionally, for example from the perspectives of (1) molecules and tissue, (2) treatment, (3) ethics and (4) policy decision-making. Fourthly, roles can be safe ways for students to try on different but professionally relevant voices, and thus to build bridges between their pedagogical being now and professional becoming in the near future. Fifthly, the question of "Whose problem is this broken leg?" can take on a broader meaning and more effectively open students' awareness of the complexity of problems per se. Sixthly, multiple roles and their allocation can make the tutorial discussion and questioning more fun and playful. This does not mean more off-the-task activities, but rather a better emphasis on a mix of fun and difficult activities (see Barrett, 2005b) instead of only anxiety. Thus, designing new formal functional roles would open up innovative paths for question-asking research and practices in PBL tutorials. The formal functional roles can act as a form of distributed cognition. This acting and enacting aspect, however, has so far neither been adopted nor fully developed and utilized.

The conclusion about neglecting transformation questions does not necessarily mean that they are the only kind of questions that should be valued in PBL tutorials. Questions have diverse purposes that can be beneficial during small-group work. For this reason, instead of assuming that only transformative questions are essential, one should attempt to build a more

appropriate balance among not only kinds of questions, but also among kinds of question askers. Currently, there is a clear imbalance in both cases.

The potential benefits of students' formal functional roles may be questioned by those who argue that investing in them is a waste of time and resources. Admittedly, students and tutors need to be sufficiently trained to participate systematically and responsibly. Students need to understand the roles in order to play them properly. Therefore, time, energy and resources are required to train students and tutors to accept and play the roles. In the beginning, resistance may be high and old habits may persist. However, formal functional roles may effectively support constructing students' collaborative knowledge by providing a focus for questioning. In addition, roles may help students overcome barriers to asking questions by offering emotional shields and by acting as effective, temporary stepping-stones between students' pedagogical being and professional becoming. Roles may help students find their own voices by offering opportunities to try out different voices safely. This could help students increase their self-confidence and passion for learning. As a result, students and tutors might engage in learning activities more profoundly, ensuring that PBL remains an effective form of education epistemologically, ontologically and practically.

Acknowledgements

I am grateful for the financial support I received from the LEARN programme financed by the Academy of Finland.

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