

LEARNING/TEACHING

Inside PBL Groups: Observation, Confirmations and Challenges

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ABSTRACT *This article is based on a study of nine problem-based learning (PBL) groups with eight medical students and one tutor in each. The groups were observed at their two-weekly meetings for three weeks. The observations were recorded by video and written reports. Three illustrative examples of these observations are presented and discussed. The purpose of the study was to understand how processes in PBL groups correspond with the theory-based intentions for this type of learning and teaching and to discuss the theoretical foundations for problem-based learning. The observations confirm the expectation that groups in the observed program would follow a systematic stepwise progression. The groups were also found to become more flexible and self-directed in their use of PBL as they became more familiar with the approach, provided that the tutor did not dominate the interactions. It is argued that processes in problem-based learning should be understood not only in the light of theories focusing on individual learning and knowledge construction, but also from other theoretical perspectives. Socio-cultural perspectives with constructs such as collaborative learning, apprenticeship and modelling shed new light on what happens inside PBL groups in ways that will enhance learning and tutoring.*

KEYWORDS *Problem-based learning, group interactions, self-directed learning, tutor role.*

Introduction

The work in problem-based learning (PBL) groups is a vital element in all problem-based curricula. It is generally agreed that effective PBL groups may

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be valued not only for the content of their work, but also for the way they work. The groups' way of working will determine what they learn and how well their learning may be recalled and applied (Abrandt Dahlgren, 2001; Barrows, 1996). Even so, systematic studies of how PBL groups work in practice are relatively rare in the rapidly growing literature on problem-based learning (Albanese & Mitchell, 1993; Lycke, 1995).

In the past decades positive effects of problem-based learning have been understood from an individual cognitive constructivist perspective. This may have blocked other ways of understanding such learning processes. Other theoretical viewpoints may contribute to our understanding and thereby contribute to further development of problem-based approaches (Evensen & Hmelo, 2000).

This article presents observations of interactions in PBL groups that will be discussed in the light of how processes in PBL groups correspond with the intentions and with different theoretical perspectives.

Observations of PBL Groups: Context, Design and Method

The Faculty of Medicine at the University of Oslo, Norway, introduced a new PBL-based curriculum in 1996 which has been positively received by the students (Lycke & Roald, 1999). PBL groups are an integral part at all levels of the six-year curriculum. Each group consists of eight students and meet twice a week with a tutor.

Qualitative methods such as observations and case studies are useful ways to examine phenomena in their natural context and to reveal diverse perspectives (Wilkerson *et al.*, 1991). For this study nine PBL groups at three different study levels were observed over three weeks in 1999. A total of 48¹ meetings were observed. Two meetings in each group were videotaped. The rest of the meetings were recorded in longhand by a trained observer. The observer also filled in a protocol to register recurring incidents systematically.

Two independent researchers reviewed the protocols and videotapes before consensus was reached on main patterns of interaction. This included analysis of how group work compared with recommendations for such work and identification of qualities that characterised various stages of the work. The analysis focused on main patterns, but was also open for variations and deviations from these.

What Happens Inside PBL Groups? Three Examples

The following descriptions are based on observations of three PBL groups at their first meeting on a case. The examples illustrate three patterns that emerged in the observations, but are most clearly shown in these three groups.²

Group A consists of new students. On observation, the atmosphere in the group seems pleasant, inclusive and encouraging. The tutor, Professor A, knows the students by name and communicates an interest in the students' discussion, even if he is fairly reticent. He uses few words to prompt the group to work systematically and to get a grasp of the situation of the patient in the case. At the beginning of the session, the students direct their attention at the tutor. Professor A usually redirects the questions and leaves the students to ponder without offering cues. At some points, however, Professor A asks the students to explain their views further or to describe how the mentioned factors may lead to the patients' problems. The students become hesitant the first times this happens. Little by little, however, the students appear more confident and support each other in attempts to explain. At the end of the meeting, the students arrive at highly relevant learning objectives, though formulated in rather broad and general terms.

Group B consists of students at the intermediate level (fourth term). They are high-spirited with a lively tutor. Professor B has a firm grip on the proceedings. He picks out one student and questions him at length. In between the tutor makes, often humorous, remarks, which the rest of the group obviously appreciates. The group's full attention is on Professor B. Few of the students volunteer comments on what their peers say, though some students elaborate on Professor B's leads. Professor B acutely picks out the issues to be discussed and draws the conclusions. At the end of the session, Professor B dictates precise learning issues to be studied before the next group meeting. He rounds off the session with a reference to one of his own patients, similar to the one in the problem case with some hints as to how he handled it. Short comments at his own expense make the students laugh as they pack up to leave.

Group C is at a more advanced level of studies (seventh term). The group appears strongly engaged in their attempts to explain what has happened to the patient. They question each other and ponder hypotheses. They refer to readings, lectures, and experiences as they work out a common understanding. Their tutor, Professor C, seems as eager as his students. His contributions broaden the discussion and invite reflection. The atmosphere is relaxed but attentive with quick humorous asides. At a point when concentration is threatened by such asides, the tutor quietly intervenes with a question pulling the attention back on track. Before the learning issues are formulated, the students check one more time if anyone in the group has more to add, accepting that the tutor keeps back. The remaining time is spent on focusing the issues and on discussing how they may cover them before their next meeting.

Intentions and Implementation

The question we may ask after reading these observations is whether the interactions in the PBL groups are in keeping with intentions for problem-

based learning. Expectations of the work inside the PBL groups will, of course, depend on visions, ideals and approaches in the curriculum they are part of.

In the Oslo curriculum (“Oslo ‘96”) the students are expected to follow a seven-step approach in their case work. Broadly speaking this means that the students at the first meeting discuss a particular case in order to understand the patient situation and identify problems. Emphasis is placed on explaining the underlying mechanisms of the problems using their prior knowledge. This is the basis for teasing out learning issues for individual study. At the second meeting the students should discuss their findings and reflect on how it applies to the case at hand. This approach has been communicated to the academic staff through numerous workshops, training activities and written materials.

The observations of the three groups clearly confirm the expectation that groups adopt the approaches advocated in the Oslo curriculum. In fact, one of the most striking findings in this study is the extent to which students and tutors comply with the systematic progression recommended.

Nevertheless, there were marked variations between the groups. Group A identified major traits and problems in the patient’s situation and brainstormed for causes. The group had difficulties, however, in explaining phenomena and mechanisms through application of prior knowledge. They addressed this step in the procedure, but with rather limited success. This is a crucial point. It is only when the students have exhausted their understanding and current knowledge that the learning issues reflect the students’ learning needs. Their attempts to explain help the students to identify what they need to know. The more precise the identification and the more accurate the students’ search for new knowledge, the more effective is their learning.

Group B also deliberated various explanations. In their case, however, the tutor played a very directive role. It was mostly the tutor who identified problems, gave explanations and even learning objectives. The students were attentive listeners rather than active contributors. Their own understanding was expressed on cues from the tutor.

Group C on their part worked intensively to reach a common understanding. The students had rich discussions uncovering misunderstandings and building connections between individual bits of information. These processes strongly motivated the students for genuine search for answers and promoted in-depth discussions.

A fair amount of differences in routine and flexibility may be related to the students’ level of study. Other studies indicate that groups become more proficient users of the PBL approach as they advance through the study program. Given the opportunity, students will—over time—become more self-directed and more flexible in their approach. In other words “If students are to take responsibility for determining what needs to be learned, and at what pace”, then tutors must be willing “to allow students to take an active role in

guiding their own learning” (Wilkerson *et al.*, 1991, p. S79). We note that the students in Groups A and C had a high degree of self-directedness, whereas this feature was low in Group B.

Observed Practice as Related to Theoretical Underpinnings of PBL

The most prominent theoretical foundation for PBL is currently cognitive learning theory. A number of researchers have emphasised the correspondence between cognitive learning theory and problem-based learning (Lycke, 1994; Norman & Schmidt, 1983; Schmidt, 1993). They argue that the necessary conditions for learning may be derived from this theoretical approach.

The implication is that if students adhere to the PBL procedure, necessary conditions for learning such as encoding specificity, relating new learning to prior knowledge, and elaborating on acquired knowledge will be present. In consequence the students will acquire content knowledge that is retrievable and applicable in their later professional careers. In the current case, the processes in Groups A and C are obvious examples.

This line of reasoning, however, does not take into account that even if Groups A and C both applied the PBL method, their approaches were qualitatively different.

Group A, for instance, seemed to hesitate when they were asked to develop their ideas or comment on their suggestions. Their way of activating and elaborating on their knowledge was fairly rudimentary. Group C worked freely with ideas based on prior knowledge. They brought in and shared new material in their discussions. They persisted in their attempts to explain phenomena and mechanisms. In contrast, there was little room for the students in Group B to articulate prior knowledge freely or to elaborate on newly acquired information.

It stands to reason that the learning experience and, more importantly, the learning impact in these three groups must have varied significantly. Consequently it may be argued that it is not sufficient to follow this approach as a procedure, and it is equally important to question the quality of the processes the procedure is intended to elicit. Examples of qualities that will enhance learning is multiplicity, activity, accommodation and adaption, authenticity, articulation and termlessness (Koshman *et al.*, 1996).

Multiplicity implies that students should encounter “material from a number of perspectives with ample time for reflection on the inter-relatedness of these” (Koshman *et al.*, 1996, p. 89). Group A and Group C both elaborated on explanations, but there were great differences in the richness or multiplicity of the deliberations in the two groups.

A focus on qualities also helps to identify what the students miss in Group B in spite of an engaging, almost charismatic tutor. Since learning is an *active* process, requiring mental construction on the part of the learner, instruction

should foster cognitive initiative and effort to achieve meaning as well as provide opportunities to *articulate* newly acquired knowledge (Koshman *et al.*, 1996, p. 90). Student activity and articulation, however, play a minor role in Group B. Koshman's other categories may be used to expand the analysis further.

Challenging the Traditional Theoretical Perspectives on PBL

The observations and discussion have so far been in keeping with the reigning paradigm of problem-based learning (Maudsley, 1999). The observed processes support constructivist learning theories, which have been "mainstream" in our understanding of problem-based learning the last decades. Within this paradigm the emphasis is on tutor *facilitation* (Duffy & Cunningham, 1996) as both Professor A and C attempt to do.

If we turn, however, from individual knowledge construction to socio-cultural perspectives, the learning processes may be regarded in a different light.³ Cognitive theories focus on the individual knowledge construction and regard the group work as an aid for the students in this process. From a socio-cultural perspective the learner is seen as transforming as well as being transformed when participating in communities of practice. The PBL group may be regarded as a social system within a larger social context. The knowledge the learner seeks is embedded in and derives from social sources, in this case, the world of medical practice and research (Hmelo & Lin, 2000, p. 4).

Knowledge is not a fixed and stable commodity, but rather co-constructed by people in interaction. Learning will take place in PBL groups as the students "... participate in shared endeavours with others, with all playing active but often asymmetrical roles in sociocultural activity" (Rogoff, 1994, p. 209). Through participation in the tutorial discourse, students internalise thinking processes (Wertsch & Bivens, 1993). Knowledge is situated and the group is necessary in order for it to be expressed, shared and developed. Students must collaborate in dealing with learning tasks (Brown *et al.*, 1989; Bruffee, 1993).

The PBL groups become learning communities where the students take on the role of apprentices moving from legitimate, but peripheral positions into full participation in the professional community of practitioners. The tutor takes the role of the master who embodies the values, knowledge and skills of the profession the students are moving into. He brings the apprentice into the professional community, by demonstrating the use of tools and supporting the apprentice's first attempts to use them (scaffolding). The master also models the ethos of the craft or the profession (Hmelo & Lin, 2000, p. 232).

This puts Professor B in a new light. Professor B models professional enthusiasm and intellectual argumentation. The students experience mastery of

the field at close range. The students also benefit from B's supportive guidance or "scaffolding" which helps them deal with complex problems they may not have mastered otherwise.

The idea of the tutor acting as a model by the force of his presence, status and knowledge is rarely considered in the PBL literature, but is well known from research on social psychology and on self-directed learning (Bandura, 1977; Zimmerman, 2000). By overlooking the modelling role of the tutor we might be miss golden opportunities for learning or neglect to address the possible problem of poor models (Vaglum, 2001; Wright *et al.*, 1997).

Within the traditional PBL concept the more flamboyant tutors, such as Professor B, risk being denounced. Very few argue the case for modelling beyond the initial phases of PBL (see e.g. Barrows, 1988, pp. 15–16).

The question might be how to integrate the "facilitator" and the "master" in a coherent tutor role. One example is Professor C who models expert thinking, as well as supporting the students in their deliberations.

Conclusion

Observations of PBL groups have been presented and discussed in relation to our intentions for the work in such groups. These intentions are largely derived from individual cognitive theory. Such observations give us a platform to describe PBL as it is conducted now. Examples were given of how attention to the qualities of the group processes might contribute to the further development of PBL according to the requirements implied by the individual cognitive paradigm.

The next step was to show how the observations not only confirm but also challenge the individual cognitive understanding of learning activities in PBL groups. An alternative approach, socio-cultural theory, was selected because of its current influence on discussions on teaching and learning.

It is not the first time that new perspectives illuminate problem-based learning. PBL was born out of frustration with the current medical education in the late 1960s. The decision at McMaster to focus learning around a series of biomedical problems presented in small groups with the faculty functioning as tutors was highly pragmatic (Barrows, 2000, p. vii).

The strong support for problem-based learning from research has come later. It has also shifted focus over time. Examples are research on general problem solving, clinical reasoning skills, and expertise (Albanese & Mitchell, 1993). The strongest rationale for PBL in the last decades has been based on individual cognitive learning theory with focus on learning *content knowledge* (Schmidt & Moust, 1999). In parallel we find another strong research orientation concerned with the further development of problem-based learning as a method of acquiring professional *reasoning skills* (Barrows, 1998, p. 50).

These research perspectives, however, focus on *individual* knowledge construction. They are only indirectly concerned with understanding a main trait in problem-based learning, i.e. the *group*. Socio-cultural theories—even if their educational consequences are not yet fully understood—appear to grasp this and other central aspects of problem-based learning and might well be explored further.

Notes

1. A few of the scheduled observations were cancelled for practical reasons.
2. The groups are called A, B and C and their tutors correspondingly Professor A, Professor B and Professor C. The same gender and title is used for all tutors to preserve anonymity.
3. The individual cognitive approach derives from Piagetian theory. This view emphasises the constructive activity of the individual as he or she tries to make sense of the world. The socio-cultural approach, on the other hand, emphasises the socially and culturally situated context of cognition (Duffy & Cunningham, 1996, p. 175).

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