

PROBLEM-BASED LEARNING

Student-generated Learning Issues: A Guide for Individual Study?

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ABSTRACT *Context:* In a problem-based learning (PBL) curriculum students discuss problems in small group tutorials. In the process, students generate learning issues that become the main starting points for their individual study.

Project focus: *This project examined three questions: (1) What is the impact of the tutorial group process on generating useful learning issues? (2) When and how are learning issues used during individual study? (3) What determines the choice of literature during individual study?*

Research method: *Interviews were done and a questionnaire was developed that was completed by 479 (69%) students in Years 1 to 4 of the Universiteit Maastricht Medical School, at the end of the academic year 1995–1996.*

Findings: *The discussions in tutorial groups, the tutors' functioning, and the quality of problems are important factors in generating useful learning issues. Learning issues are mainly used at the beginning of individual study and are important influences on the selection of literature for further study. Also important in determining the selection of literature are literature references and objectives given to the students by their teachers.*

Conclusions: *Given the importance of the independent study component of PBL in determining the students' learning outcomes, and the influence of learning issues in guiding students' independent study, effective planning for and implementation of PBL requires that close attention be paid to those factors that shape the selection of learning issues.*

Introduction

The curriculum at the medical school of the Universiteit Maastricht follows the

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principles of problem-based learning (PBL) (Barrows & Tamblyn, 1980). Groups of eight to ten students each, guided by tutors, discuss problems and seek to explain the described phenomena in terms of underlying processes, principles or mechanisms. During these group discussions some questions remain unanswered, requiring further exploration. Each tutorial group decides which issues are essential for a better understanding of the problem at hand (Barrows, 1988; Schmidt, 1993). These are the so-called learning issues and are assumed to be the starting point for each student's individual study.

Research on learning issues in PBL-based curricula has examined whether student-generated learning issues are in line with faculty-designed learning objectives (Coulson & Osborne, 1984; Shahabudin, 1987; Dolmans *et al.*, 1993). For example, Dolmans *et al.* (1993), collected information on learning issues generated by twelve tutorial groups over twelve problems in a PBL-based program. In this study students identified 64% of the faculty's learning objectives, suggesting that students in a tutorial group, to a large extent, can determine what topics are important to be studied.

Blumberg *et al.* (1990) investigated the role of student-generated learning issues and the learning initiatives taken by students in seven different PBL-based schools. In five of the schools students were assumed to play an active role in generating learning issues and were evaluated on their ability to generate appropriate learning issues. In these schools students appeared to take more initiative in their learning and use a wider range of learning resources than in the other schools. The authors concluded that for the development of self-directed learning skills, the process of defining and using student-generated learning issues is important. However, it is not clear from that study how learning issues are formulated or what aspects of the group's process contributed to the generation of useful learning issues.

Gijselaers & Schmidt (1990) have proposed a theoretical model for guiding investigations of the influence of group behaviour and related factors on the learning process in PBL. Their model describes input, process, and outcome variables. Input variables are prior knowledge, quality of problems, and tutor behaviour. Process variables are study time and group functioning. Outcome variables are learner achievement and interest in subject matter. Their findings related to group-functioning variables demonstrate that the quality of the problems used is a key to optimal group functioning. Less important, but still of significance to the group's effectiveness, is the tutor's functioning. Since learning issues are a result of the discussion in the tutorial group, it is likely that these factors are also important determinants of the quality of the learning issues generated.

A major assumption of PBL is that learning issues are the dominant force in driving students' learning activities (Walton & Matthews, 1989). They are assumed to guide students during the selection of literature. It is also assumed that students use their learning issues subsequently, during their studying and to evaluate whether they have studied enough. There has not yet been, however, an

investigation of whether these assumptions are reflected in practice. Perhaps, for example, students use learning issues only to decide what they are going to study and not during their actual studying.

Although learning issues are considered to be important for individual study, other aspects in the curriculum may also influence the students' decisions of what to study. To shed some light on what factors are important in generating useful learning issues and what factors influence the ways students accomplish their individual studies, we undertook the research reported here, focusing on the following questions:

1. What is the impact of the tutorial group process (discussion in the tutorial group, tutor, and problems) on generating useful learning issues?
2. When and how are learning issues used during individual study?
3. What determines the choice of literature during individual study?

Method

Instrument Development

Twelve medical students from Years 1 to 4 were interviewed. The aim of the interviews was to explore which factors in the tutorial group process students consider important in generating useful learning issues, and how learning issues and other factors play a role during individual study. Based on these interviews, a questionnaire was developed, consisting of 36 statements, divided into ten clusters.

Clusters 1 to 3 concern the first research question (Which aspects in the tutorial group are important for generating useful learning issues?):

1. Quality of discussion in the tutorial group (five items).
2. Functioning of the tutor (two items): the expertise and influence of the tutor in the tutorial discussion.
3. Quality of the problems (five items).

Clusters 4 to 6 relate to the second research question (When and how are learning issues used during individual study?):

4. When learning issues are used (four items): before, during or after studying.
5. How learning issues are used (seven items): as a guideline when selecting literature or as a starting point when choosing the content within literature.
6. The use of learning issues for preparing for the examination (two items).

Clusters 7 to 10 deal with the third research question (What determines the selection of literature during individual study?):

7. Course objectives in the "blockbook" (syllabus) (two items).
8. Assessment (two items).
9. Lectures and practical work (three items).
10. Literature references (four items).

Students were asked to indicate on a five-point Likert scale the extent to which they agreed or disagreed with each statement (1 = completely disagree to 5 = completely agree).

Procedure

At the end of the 1995–1996 academic year the questionnaire was administered to all medical students ($n = 700$) of the first four years of the six-year Maastricht programme. Students were asked to base their answers on the past academic year.

Analyses were initially carried out for all four years. Subsequently, analyses were carried out separately for each year. For each cluster, the mean score per item, and the mean score for each student were computed. To calculate the mean score of each cluster, the mean scores of the items in each cluster were counted and divided by the number of items of that cluster. To assess the reliability of the clusters, Cronbach's Alphas were computed (Crowl, 1996). Specific differences between the years of training were analysed with post-hoc analyses, using the Scheffé F-test (Gay, 1992).

Results

In total, 479 students completed the questionnaire (response rate = 69%). In the first year the response rate was 73% ($n = 156$), in the second year 72% ($n = 149$), in the third year 72% ($n = 101$) and in the fourth year 55% ($n = 73$).

Table 1 shows that the Alphas of the clusters vary from .48 to .70. Internal consistency of the second (functioning of the tutor), third (quality of problems) and the tenth (literature references) clusters are low. This indicates that the items in each of these clusters are independent and do not form one cluster. Furthermore, the p values shown in Table 1 show that some clusters are significantly different between the years.

Determinants of Useful Learning Issues

The results in Figure 1 show (at least for these students) that generating useful learning issues in all years depends on the quality of the discussion in the tutorial group ($M = 3.8$). A requirement is that the quality of the discussion should be well structured and the students must listen to one another. Compared with students in other years, students in the third year indicate that the quality of the discussion in the tutorial group is less important. Their opinion differs significantly from the opinions expressed in the other years. The functioning of the tutor is also important in generating useful learning issues ($M = 3.8$). No significant differences between the years were found in opinions about the importance of tutor functioning.

Table 1. Number of items per cluster (*n* items), mean score (mean on scale of 1 to 5), standard deviation (SD), number of students (N), alpha coefficient (α) and *p* values (significance of differences between years of training)

Clusters	<i>n</i> items	Mean	SD	N	α	<i>p</i>
<i>Determinants of useful learning issues</i>						
1. Discussion in tutorial group	5	3.8	0.63	479	.70	.000
2. Functioning of tutor	2	3.8	0.81	479	.50	.080
3. Quality of problems	5	3.6	0.56	479	.48	.081
<i>Use of learning issues</i>						
4. Moment of using	4	3.4	0.83	479	.62	.000
5. Way of using	7	3.5	0.64	479	.70	.000
6. Assessment preparation	2	2.2	0.98	479	.66	.002
<i>Determinants of literature selection</i>						
7. Course objectives	2	3.3	1.0	479	.62	.309
8. Assessment	2	2.6	0.83	479	.66	.162
9. Lectures and practical work	3	3.0	0.65	479	.69	.000
10. Literature references	4	3.7	0.98	479	.54	.121

Significance level: $p = .01$.

Students in all years report that the quality of a problem is somewhat less important, but their scores are still relatively high ($M = 3.6$). Problems should provide sufficient cues for starting the discussion. No significant differences between the years were found.

Use of Learning Issues

The results in Figure 1 show that the timing of when students use learning issues during individual study differs between the years (mean scores vary between 2.2 and 3.5). First year students use learning issues most extensively before and during individual study ($M = 3.4$). During the next two years this decreases significantly from 3.7 to 3.0, rising again slightly in the fourth year ($M = 3.3$). Students report at the item level that they use learning issues especially before they start their individual study ($M = 4.2$). This use decreases from 4.4 in the first year to 3.9 in the third year and to 4.2 in the fourth year. While studying, students use learning issues less than they do before starting their individual study. The use of learning issues while studying the selected learning materials decreases during the first three years (from $M = 4.1$ to $M = 2.9$) and increases slightly in the fourth year ($M = 3.3$).

The average of the scores for the cluster of items related to the way that students use learning issues during individual study is 3.5. Important in this cluster is that students use learning issues especially as a guide to selecting the literature they plan to study. For this cluster, there are no significant differences between the years. At the item level, using learning issues to select literature

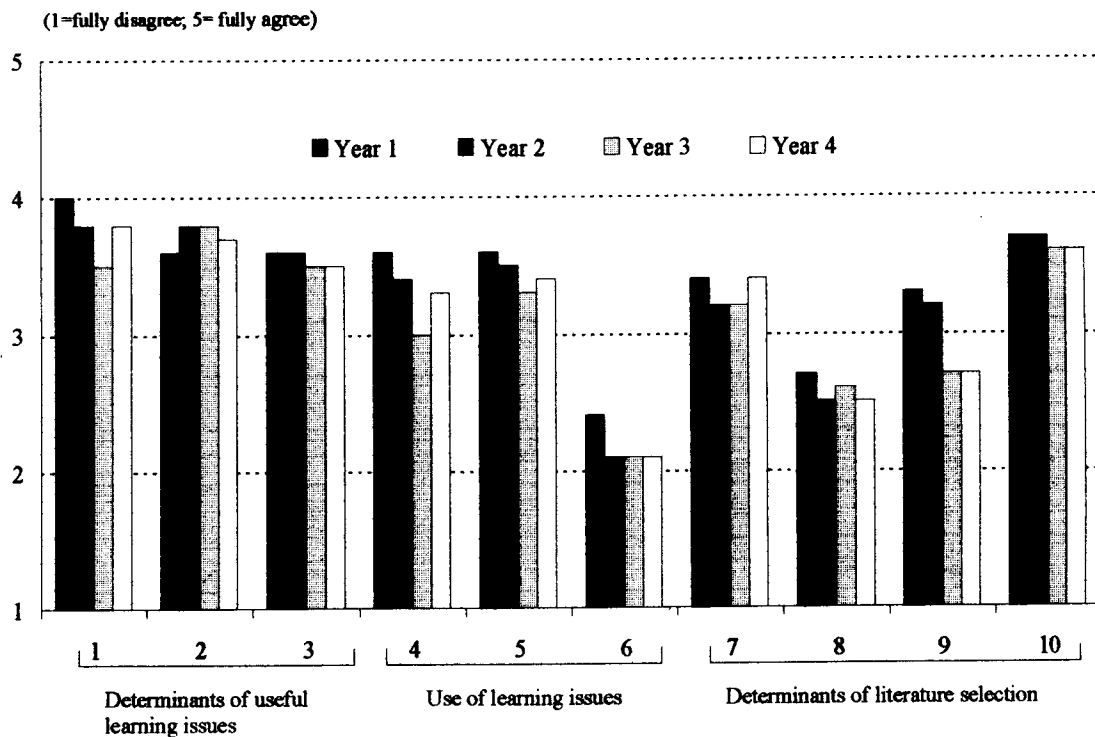


Figure 1. The mean score of each cluster per year. The numbers on the X-axis represent the following factors: 1. Discussion in tutorial group; 2. Functioning of tutor; 3. Quality of problems; 4. Moment of using; 5. Way of using; 6. Assessment preparation; 7. Course objectives; 8. Assessment; 9. Lectures and practical work; 10. Literature references.

decreased during the first three years (from $M = 4.1$ to $M = 3.4$), and increased slightly in the fourth year ($M = 3.7$). Learning issues are not being extensively used as a guide to prepare for tests ($M = 2.2$). Although first year students scored significantly higher on this cluster, compared with students in other years, their mean score of 2.4 suggests that learning issues are not highly important when preparing for tests.

Determinants of Literature Selection

The mean scores of the clusters concerning other factors that influence literature selection vary between 2.6 and 3.7, with minor differences between the years. In all years, the literature references in the blockbook or given by the tutor have the most impact on the students' selection of literature ($M = 3.7$). The course objectives also influence the selection of literature ($M = 3.3$). The contents of lectures and practical work have less impact on literature selection ($M = 3.0$), but are significantly different between the years. During the four years the impact of lectures and practical work declines. The influence of assessments on literature selection is low ($M = 2.6$) and not significantly different between the years of education.

Discussion

The first question of this study was concerned with the impact on generating useful learning issues of factors in the tutorial group process (the discussion in the group, the tutor, and the problems). The results suggest that the impact is greater if the discussion in the tutorial group is well structured and students listen to each other. The discussion in the tutorial group is guided by a discussion leader who, in our setting, is always a member of the group. This leader has the important but difficult task of structuring the discussion. Although students are given some training for this role, it can still be difficult being a student-leader of the discussion. It is clearly important that students are trained well for this responsibility.

Whereas the student leader structures the discussion, the content of the discussion is monitored by the tutor. The present study shows that students think that for generating useful learning issues, it is important that tutors, when necessary, contribute their content expertise to the discussion. Furthermore, they indicate that problems must lead to sufficient discussion. These findings are consistent with those from the study of Gijsselaers & Schmidt (1990). They also found that tutor behavior and the quality of the problems are important for optimal functioning of the group.

A limitation of the current study is that it does not make clear what students consider to be useful learning issues. Further research should help clarify the students' perspectives on the essential characteristics of useful learning issues.

The second research question concerned whether learning issues serve as guides during individual study. In the introduction, it was stated that many consider learning issues to be the major force in driving students' learning activities. The results of this study seem to support this view: learning issues are predominantly important for initiating individual study and for determining what topics should be studied. During and after studying, however, learning issues appear to be less important. This finding may indicate that students, while pursuing reading, are not strongly focused on whatever guidance might be provided by their learning issues. However, the results show significant differences between the years. In the first year, students use learning issues more as a guideline (before and during studying) than do students in more senior years. Perhaps first year students confine themselves more strictly to the content of learning issues while more seasoned students have learned to study also according to their own spontaneous learning needs and interests. This could suggest that, with experience, students in a PBL curriculum become more independent learners. Further research must investigate in more detail how student-generated learning issues play a role in the development of students as independent learners.

The third question was about other factors that play a role in selecting literature for study. Literature references given by the tutor or specified in the blockbook, and the course objectives developed by the faculty all turn out to be

important influences on the students' reading decisions. It is not surprising that students focus on these teacher-provided references and objectives when selecting learning resources. The recommended references are related to the content of the problems and provide direction regarding the topics to be studied. They can save students a lot of time. However, those students who undertake their own literature searches can acquire skills that are needed for their future learning. Therefore, detailed or highly-targeted reading suggestions and objectives offered by tutors and syllabi may be counter-productive. They may keep the students from learning to make selections themselves.

Finally, a limitation of this study is that all the findings derive from student opinions. Although students are in an optimal position to witness and comment upon many of the investigated factors, their primary role is to learn, not to be observers of the processes in which they are engaged. And, they are not necessarily critical observers of these processes at this stage of their development. Therefore, additional studies of the issues investigated here are clearly needed. A desirable strategy in a future study, for example, would involve direct observations, by skilled observers, of the functioning of multiple, different tutorial groups.

Conclusions

Independent study is a core component of effective PBL. The quality and the areas of focus of this independent study help determine the students' learning outcomes. The investigation reported here has reconfirmed earlier findings that learning issues can exert a considerable influence on parts of students' independent study. While this research had limitations, as noted, and it was conducted at only one school, it seems reasonable to conclude that learning issues are in need of being better understood, and that effective planning for and implementation of PBL requires that close attention be paid to those factors that shape the generation and selection of learning issues.

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