
DEVELOPMENTS

Use of Student-Generated Learning Issues to Evaluate Problems in a Problem-Based Curriculum

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Editors' Note: This article illustrates an indirect way of using student learning data to evaluate curriculum (Section One). In addition, it provides a description of a problem-based curriculum (Section Two).

Student learning in a problem-based curriculum depends on the quality of the problems presented to students. Based on the discussion of these problems, students generate learning issues, defining the subject matter to be studied during a course. Despite the important effect of problems on student learning, these learning issues are rarely used as a tool for problem review and evaluation. Our article describes a process at the medical school of the University of Limburg, The Netherlands, to review and improve problems by comparing the learning issues generated in the tutorial group with the objectives that teachers intended while developing the problem. To validate the usefulness of this technique as a tool for practicing quality control on problems, a questionnaire was administered to faculty to assess their perceptions. The results confirm that indeed student-generated learning issues are useful as a review tool in program evaluation.

Problems are essential as tools for problem-based learning (PBL). Students in a problem-based curriculum meet in small-group tutorials to confront problems, descriptions of sets of observable phenomena in need of explanation. The tutorial groups discuss these problems, trying to explain the phenomena in terms of underlying processes, principles, or mechanisms.¹ The issues that emerge requiring further exploration are considered learning issues and are assumed to be prerequisites to a better understanding of the problem.² During the days before the next tutorial group session, students study material relevant to these learning issues, using resources such as literature and audiovisuals. In the next session, students report what they have found and try to synthesize the newly acquired information.³ Each tutorial group is guided by a tutor, usually a faculty member, whose role is to facilitate the ongoing learning.

Thus student learning in a problem-based curriculum is largely dependent on the nature of the prob-

lems presented. Illustrative evidence comes from Gijselaers and Schmidt,⁴ who developed a causal model characterizing the important features of a problem-based curriculum. Their model distinguished between input variables, such as tutor functioning, problem quality, and prior knowledge; process variables, such as group functioning and study time; and output variables, such as student achievement and interest. They found that problem quality has a great overall influence on both process and outcome variables in PBL. This is an important finding, because it provides opportunities for educational improvement (i.e., it suggests that student learning in a problem-based curriculum can be improved by improving the problems presented).

Although problem quality seems to have a great overall influence on student learning, only a few studies in PBL address the issue of problem design. Majoor and colleagues⁵ and Bouhuijs and Gijselaers⁶ developed

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several criteria to be applied to the construction of problems. Solomon and associates⁷ examined the extent to which age-related information in a problem influenced the tutorial discussion. Snellen-Balendong⁸ reported experiences with different problem formats. These studies all focused on problem design but did not suggest methods for problem review or evaluation.

In this article, we describe a process of problem review by comparing the learning issues generated in the tutorial group with the objectives that faculty authors had in mind while developing the problems. We defined the effectiveness of a problem as the match between student-generated learning issues and the preset faculty objectives.⁹

A number of studies dealt with student-generated learning issues. These focused on examining whether students do actually identify the required knowledge, by comparing student-generated learning issues with the intended faculty objectives, at the course level.¹⁰⁻¹² Despite the importance of student-generated learning issues in a problem-based curriculum, only one cited study focused on the usefulness of student-generated learning issues as a tool in a policymaking process of problem review and evaluation. Blumberg and colleagues² conducted a study on the use of student-generated learning issues at seven North American medical schools with problem-based curricula and concluded that student-generated learning issues play a varying role across institutions and that the degree to which learning issues guide student learning depends on the extent to which the problem-based program is more or less student or faculty centered. They reported that even in the student-centered, problem-based curricula, unanimously recognizing the key role of student-generated learning issues, these issues are rarely used as a way of practicing quality control on the problem-based curriculum. Only one of the medical schools they studied, Rush Medical College, uses student-generated learning issues as feedback to faculty. There, the learning issues generated by all tutorial groups for each problem are reviewed at the end of each quarter to show which topics are covered by students and to prepare resource sessions in which basic-science faculty meet with students to explain difficult concepts.

Thus, although research has stressed the importance of problem quality on student learning and problem quality is assumed to be controllable and manageable, little effort has been given to investigating how student-generated learning issues can be used as a review tool for problem development. In fact, even in those curricula in which learning issues are assumed to define content studied by students, student-generated learning issues are rarely used as a review tool.

The purpose of this article is to demonstrate how student-generated learning issues are used at the medical school of the University of Limburg as a tool

for problem review and evaluation and how the involved faculty have evaluated that review process.

Description

The medical school of the University of Limburg initiated the collection of student-generated learning issues in the academic year 1988-89. The faculty's need for this information resulted from having a new curriculum implemented, with new problems. Course-planning groups, each a multidisciplinary team of four faculty members and one chairman, the course coordinator, were responsible for the construction, implementation, and evaluation of these new problems. In addition, a curriculum-review committee was founded to keep track of all revisions of the curriculum by staying in close contact with the course coordinators to offer support, advice, and criticism.

Student-generated learning issues were collected by asking each tutor to note on a form the learning issues generated for each problem by his or her tutorial group. The tutor also could add comments regarding problem quality. Learning issues were collected in all six courses of the first-year curriculum for 2 consecutive academic years, because it was assumed that problem quality would be optimized within 2 years if student-generated learning issues were available to provide faculty with feedback about the quality of the problems. There were 18 tutorial groups attending each course, each comprising about 10 students. Courses had 10 to 19 problems and lasted 6 weeks.

The completed forms were to be sent to the educational administration office within 2 weeks after the end of each course. The tutor's response rate during the 2 years varied for each course from 56% to 94%. Subsequently, a report was produced containing the list of learning issues generated by all tutorial groups for each problem, with copies sent to the coordinator and members of the course-planning groups and to the curriculum-review committee.

Each course-planning group evaluated problem quality by comparing the list of student-generated learning issues with the faculty objectives for that problem. If a problem led students to generate learning issues similar to the preset faculty objectives, the problem was considered effective and no changes were required. However, if the problem failed to guide the majority of the tutorial groups to identify important faculty objectives, the course-planning group was required to improve the problem. The priority of faculty objectives to be identified by tutorial groups was decided by the course-planning groups. Problem revisions might have been, for example, adding a few cues into the problem text related to the unidentified faculty objectives. All revision suggestions were reported to the curriculum-review committee. In this way, the list of student-generated learning

issues was used in a larger policymaking process of problem review and evaluation.

Faculty Perceptions of the Usefulness of the Process

To evaluate our process of using student-generated learning issues for problem review and evaluation, a questionnaire was constructed to measure faculty perceptions. In the academic year 1988–89, five members of the curriculum committee and six course coordinators were asked to complete it. The questionnaire contained seven statements to assess the adequacy of student-generated learning issues as a tool for problem review and evaluation, such as “student-generated learning issues indicate whether students are able to identify the preset faculty objectives,” and “problems were actually improved by making use of student-generated learning issues.” The respondents were asked to rate these statements on a 5-point scale from *totally disagree* (1) to *totally agree* (5). The questionnaire also included an open-ended question in which respondents could suggest possible improvements. The response rate was 82% (9 of 11 respondents).

Overall, the process was considered valuable. Two statements concerning the usefulness of student-generated learning issues scored rather low. The first statement, that student-generated learning issues provide information about the subject matter lacking in a course, had a mean score of only 2.5 ($SD = 0.93$). The second statement, that student-generated learning issues provide insight into students’ learning activities regarding a particular problem, had a mean score of 3.1 ($SD = 0.94$). Respondents’ comments on the open-ended question revealed that learning issues were especially useful when implementing newly designed problems. After 2 years of experience with a course, learning issues should be collected only for the newly designed or improved problems. Respondents also reported that tutor’s comments with regard to the quality of problems contain important guidelines about how to improve a poor problem. Based on these tutor comments, problems were actually improved. In general, the results of this questionnaire indicate that faculty perceived student-generated learning issues as a useful source of information for improving problems.

Discussion

The aim of this article is to demonstrate how student-generated learning issues are used as a source of descriptive information for problem review and evaluation at the medical school of the University of Limburg and to report faculty members’ perceptions of the usefulness of this process. The collection of student-generated learn-

ing issues at the medical school of the University of Limburg is actually incorporated into program evaluation as a review tool. The course-planning group, responsible for the construction, implementation, and evaluation of the course, uses the list of student-generated learning issues as a source of information to assess the adequacy of the problems by comparing these issues with the faculty-intended objectives. At present, the collection of learning issues takes place at the medical school of the University of Limburg when a course contains several newly designed problems.

Results from a questionnaire to assess faculty perceptions of the adequacy of using student-generated learning issues for problem review indicated that the process is valuable. However, these learning issues provide only minor information about underrepresented subject matter and students’ actual learning activities.

Experiences with the use of student-generated learning issues for problem review at the University of Limburg also revealed several unanticipated findings. First, trade-off mechanisms may occur when problems are changed within a course (i.e., changing a particular problem influences the adequacy of other problems). For example, changing the order in which the problems are presented or skipping one problem in a course may have a negative influence on related problems. Thus problems cannot be designed or redesigned in isolation, because they build on each other.

Second, students’ priorities regarding particular learning issues may influence problem quality. For example, faculty observations indicate that students do not study the social science issues or even consider them to be learning issues to the same extent to which they study biological or physiological issues. A previous study,⁹ assessing problem effectiveness, also indicated that students prefer biology and physiology learning issues at the expense of psychological issues. As a consequence, problems that address social science issues may not really improve in terms of learning issues generated, even after changes are carried out.

Third, because of differences in priority of faculty objectives, the course-planning group may decide to change some problems, even though students did identify the preset faculty objectives. For example, a course-planning group can be of the opinion that students spent too much time on particular issues at the cost of other issues, which they perceive to be of greater importance, and so the group can decide to review the problem. Thus priorities assigned to the faculty objectives may also play a role in the process of problem evaluation and review.

Conclusion

The collection of student-generated learning issues seems to be useful as a review tool in program evalua-

tion. However, it should be kept in mind that these learning issues provide only partial information about students' actual learning activities during a course. Moreover, it is not only the match between student-generated learning issues and preset faculty objectives that should be taken into account when evaluating problem quality but also the priority of faculty objectives and students' preferences for particular issues. Presenting a list of student-generated learning issues is a valuable procedure to incorporate in program evaluation. Student-generated learning issues encourage faculty to specify the objectives of each problem clearly and to evaluate whether those objectives are being met.

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