

Curriculum Design for Problem-Based Learning on a Volunteer Basis: A Yonsei Approach

Sun Kim, Soo-Kon Lee, Moo-Sang Lee, and Duck-Sun Ahn

Department of Medical Education, Yonsei University College of Medicine, Seoul, Korea.

Innovative new medical programs such as Problem Based Learning (PBL) are being developed worldwide. An increasing number of medical schools are starting to introduce these programs into or even to replace the existing curriculum. At Yonsei University College of Medicine (YUCM), we developed our own PBL curriculum and evaluation method. In order to develop a program suitable for our school, we suggest that for trial purposes, a small number of student and teacher volunteers should be selected and that the tutors involved in the program be given adequate training.

Key Words: Problem-based learning, curriculum design, tutorial, evaluation

INTRODUCTION

Yonsei University College of Medicine (YUCM) established in 1885, is famous as the oldest and the most distinguished medical school in Korea. YUCM demonstrated its pioneering spirit by being the first to introduce western medicine to the nation. Currently there are approximately 160 students enrolled in each of four classes in the medical school. As it is difficult to change the medical curriculum or to even expect changes especially in schools with longstanding practices, currently, a lecture oriented traditional curriculum is in effect. However, recently innovative medical programs such as Problem-Based Learning (PBL) have been introduced worldwide, and more and

more medical schools have started to introduce these programs.¹⁻⁵ YUCM also first introduced PBL in 1997, after much consideration. We decided to apply the program first to the fourth year medical students, however, because the basic tenet of the PBL program involves the development of basic reasoning skills, from the earliest stages of medical education, we applied the PBL program in 1998 to the first and second year classes. However, to date the PBL program has not yet been included into the regular curriculum, and instead is run by students and teachers on a volunteer basis. The reason for running the program in an extracurricular fashion is to find out whether the innovative program can fulfill the requisites of the current traditional curriculum. In this research paper we would like to present details of the development of the PBL program currently running in YUCM, and describe how the evaluation of student learning in PBL is conducted. The purpose of this study was to identify the various necessary conditions required to begin PBL in schools with a traditional curriculum and to provide core ideas concerning the development of new innovative programs.

MATERIALS AND METHODS

To achieve the purposes of this study the emphasis was placed upon qualitative methodology. The detailed methods used are detailed as follows.

First, we analyzed the minutes of PBL committee of Yonsei University College of Medicine.

Second, we consulted faculties that had participated in the development of the PBL curriculum in YUMC.

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Reprint address: requests to Dr. Moo Sang Lee, Department of Medical Education, Yonsei University College of Medicine, C.P.O. Box 8044, Seoul 120-752, Korea. Tel: 82-2-361-5804, Fax: 82-2-364-5450, E-mail: maluro@yuunc.yonsei.ac.kr

Third, evaluation methods for PBL were developed and designed.

RESULTS

Selecting subject for curriculum design

PBL is not currently included in the regular curriculum at YUCM. Since students participate on a volunteer basis, the burden to meet the objectives of PBL is totally dependent upon the students free will. This situation was taken into account and a PBL program was developed to supplement the current second semester courses of the first two years of medical school in order to motivate students. We chose the second semester of the first year to begin the PBL program in order to utilize two hours previously assigned as study hours.

To combine basic science and clinical medicine, we reviewed the regular courses of the first year, which are neuroscience, behavioral science, immunology, microbiology, and physiology.

The Immune System (IS), in which an integrative approach is possible, was chosen for the development of the PBL program, since IS includes much of the course contents of microbiology and immunology. Accordingly, five modules were chosen as study subjects for PBL curriculum. In conjunction with the IS oriented PBL modules, two study objectives were contrived. The first objective of PBL concerned IS related knowledge of basic science, which must be applied during problem solving, for example diagnostic situations in order to acquire self directed learning skills. The second involved the acquisition of microbiological knowledge, and to learn how to apply basic scientific knowledge of IS in clinical situations. Thus, immunology modules were selected for first year students. When selecting the modules for the second year students, we examined the major courses in the current curriculum for the second semester of the each class in YUCM. As a result, the second year students major courses were chosen in the internal medicine, neuroscience, and reproductive medicine subject areas, which were consequently selected and integrated into a PBL program. In

addition, the modules in each of the subject areas and appropriate learning objectives were developed for the second year class. Some examples of the modules for the year 2001 are shown in Table 1.

Table 1. Problem-Based Learning Modules for Year 2001⁶

Year	Subject	Modules
1	Immunology	Myasthenia gravis
		Facial Rash with Chest Pain
		Graves' disease
		Asthma
		Pneumocystis carinii pneumonia in AIDS
2	Neuroscience Endocrinology	X-linked agammaglobulinemia (Bruton's disease)
		Amyotrophic lateral sclerosis
		Ruptured Cerebral Aneurysm
		Cerebral malaria
		Diabetes Mellitus
		Adrenal Cushing's syndrome

On the other hand, the format of PBL module is closely related to the steps in the PBL program. In other words, the module must be developed in accordance with the PBL steps. At YUCM we have developed our own progress diagram (Fig. 1) for PBL by consultation with our specialists.⁷

The first session of the first module will start by introducing each other. When the class climate reaches a certain level and participants are ready to deal with a case, a moderator and a rapporteur are selected. The problem is presented and the students start to think about cues that are associated with the problem. Through brain storming and building up the cues, students will arrive at some hypothesis. Some of the issues brought up during discussions will be learning issues for the students to investigate further during the self-learning period. Students ask many questions about the problem and the tutor will give some information of the case, upon items such as, the past history, review of the system, physical examination results and laboratory tests results. Given such added information, a hypothesis may be regenerated or some additional learning issues raised. The class adjourns with

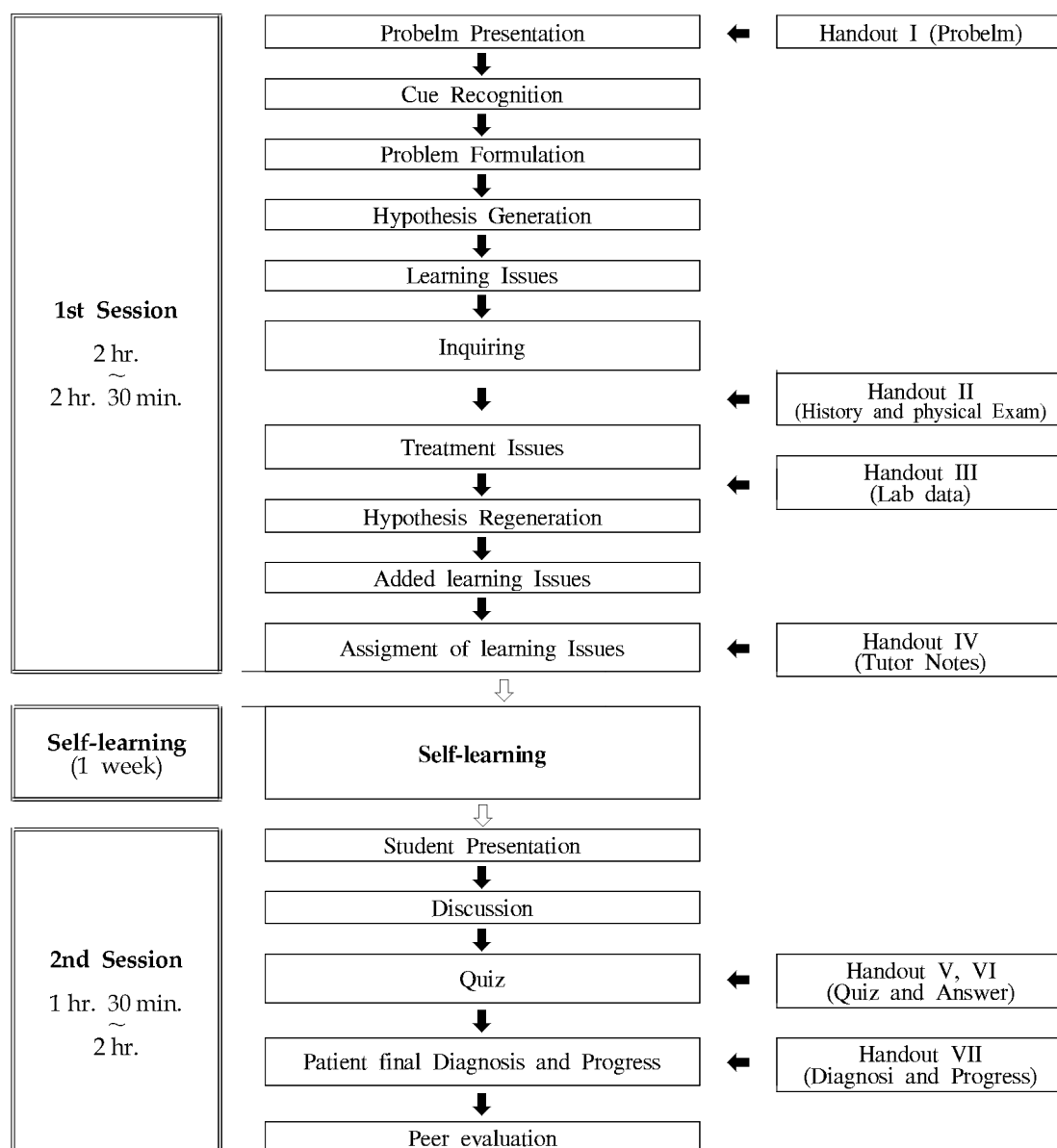


Fig. 1. Procedure of problem-based learning (Yonsei University College of Medicine).

assignments of the learning issues for student self-study.

The second session starts with a presentation by students. A student might tell the class what he or she has learned from the self-learning period and share this information. When all the students have presented, a group discussion is held about the case and an effort made to determine the most appropriate answer to the problem. A quiz use as a means of summarizing and the session ends with a brief summary and evaluation. The impor-

tant thing to note is that during these sessions, the tutor should play the role of a facilitator.

Student and tutor recruitment

As mentioned above, students participate in PBL on a volunteer basis in YUCM, which tends to increase the level of student motivation. The number of students participating during the year 1999-2000 are shown in Table 2. Usually more first year students volunteer for PBL. Some

Table 2. Number of Students and Tutors Participated in PBL 1999 - 2000

	1999		2000	
	Year 1	Year 2	Year 1	Year 2
No. of students	42	41	56	28
No. of tutors	7	12	14	8

students in the second year involved in PBL have experienced PBL their first year, and many of these are active participants in the sessions.

An effective PBL session depends primarily on the ability of the tutor. PBL sessions centered on a small group of students require a tutor who has expert knowledge of how to carry out the session and on the subject content. In particular, understanding the dynamics in a small group is a key factor to effectively carrying out a PBL session. Thus, we provide a Tutor Training Workshop on PBL sessions, and tutors are only allowed to participate after completing the workshop. Topics dealt with in the Tutor Training Workshop are; underlying principles of PBL; understanding group dynamics and PBL session evaluation. On the other hand, modules applied in PBL sessions are of an interdisciplinary nature and are developed primarily by the content specialist. Consequently, in order for a tutor to carry out a session effectively he or she must have prior knowledge of the module. To convey knowledge to tutors prior to PBL sessions and to discuss modules, preview sessions are conducted. These sessions are held regularly once every two weeks, and the module developer provide explanations on the modules, together with the objectives and important points.

Evaluation

PBL focuses on the learning process rather than on the product of learning. So in the case of PBL, how the students learn is of more interest than what students learn. Subsequently, performance assessment would be more appropriate for evaluating this sort of learning.⁸ However, various kinds of performance assessment, could be used to evaluate student achievement. At YUCM we have used tutor evaluation based on student participation and have also developed a summative

assessment using MEQ (Modified Essay Question) and an oral assessment known as the Triple Jump.

Progress evaluation

Evaluation of the learning process in Fig. 2 shows that the tutor observe students during learning sessions in order to evaluate each student, and the group as a whole.⁹ For this purpose, tutors are required to accurately identify students and to carefully observe them to allow a systematic evaluation of each individual.

Modified essay question (MEQ)

In order to determine how well the students have achieved their learning objectives, we consult with the module developer in the development of a Modified Essay Question, to be answered by the student at the end of the PBL process. Unlike choosing an answer in a multiple-choice type of question, MEQ is a type of descriptive evaluation, which requires the student to solve the problem subjectively. Thus, the questions are fashioned not to simply ask for knowledge, but to demonstrate problem solving ability, judgment, and decision-making. PBL is achieved through a step-by-step process and accordingly MEQ is based on the evaluation of multiple steps. We currently use a three-step format in this evaluation. The time given to solve each questions is between five to fifteen minutes and the evaluation scores are distributed according to the degree of difficulty.

Triple jump

Another type of evaluation method used in PBL is the Triple Jump, which is used as a method of oral assessment to evaluate how well the students apply their acquired knowledge, and understand and analyze problems in clinical situations. This formative and summative test is given individually, and the examiner will make a careful evaluation of each step. Specific criteria of this evaluation, include, cue recognition, hypothesis generation, application of knowledge, recognition of learning objects, management of learning

<input type="checkbox"/> PBL lesson group_____		<input type="checkbox"/> Module No._____	
<input type="checkbox"/> Tutor's Dept:_____ Name:_____		<input type="checkbox"/> Date of Session_____	
<input type="checkbox"/> Presider_____ Scribe:_____		<input type="checkbox"/> Dur. of the Session_____	

Student's name	Degree of Inveolvement			Degree of Problem comprehension			Comment: Please write your opinions on the each student
	high	middle	low	high	middle	low	

Group evaluation	<p style="text-align: center;">Comment: Please write your opinions on the group as a hole</p>						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 33%; padding: 5px;">high</th> <th style="width: 33%; padding: 5px;">middle</th> <th style="width: 33%; padding: 5px;">low</th> </tr> <tr> <td style="height: 30px;"> </td> <td> </td> <td> </td> </tr> </table>	high	middle	low				
high	middle	low					

☞ **Criteria of Evaluation:**

- ⦿ Degree of Participation (by individuals): concentration, active involvement, level of questioning
- ⦿ Degree of Problem Comprehension (by individuals): understanding the problem, selection of theory, use of prior knowledge
- ⦿ Group Evaluation: Level of achievement on learning objective

Fig. 2. Progress evaluation of PBL (Session 1).

material, development of new facts and understanding the relationships between facts, and self-evaluation.

DISCUSSION

The development and application of PBL have

been investigated worldwide, as we have enthusiastically examined the concept in Korea. However, in terms of enforcing any particular program is concerned, there is an ongoing debate on whether the program must be introduced into the medical curriculum. The time to introduce the program, the format of the module, and so forth are also topics of debates. Here we would like to

discuss the implication we could suggest based on the research result so far mentioned in making interpretations to develop and apply PBL programs in actual setting.

First, PBL was introduced in 1997 to the entire senior class of 170 students in YUCM. However, feedback shows that it was received with much pessimism by teachers and students, and was perceived at first to be ineffective. Consequently, in our school, it was determined that introducing PBL first to the senior class was not only unreasonable, but because the students had already been exposed to the clinical settings, they would be inappropriate for the sake of the PBL goal. Since this first introduction, the PBL program has been targeted to the first and second year classes, and it has been found to be both possible and appropriate to meet the goals of PBL. These students showed much higher levels of satisfaction during discussions concerning the PBL process and actively participated in the after evaluation of the PBL program. Accordingly, PBL was assessed to be effective if it is centered on small groups. However, it has been shown that since students currently on PBL programs are still taking regular courses, and it was clear that students had insufficient time for the self-directed learning, which is both a necessity and an objective of PBL. Thus, it is suggested that the students workload must be taken into consideration when the PBL program is operated in conjunction with regular course work.

Second, it need to be resolved as whether there would be satisfactory good cooperation between basic scientists and clinicians, and would the integration of basic science and clinical practice be successful? In the PBL programs operated to date, both basic scientists and clinicians have participated in the development of the programs, and the modules used. In fact, though the original program contents was developed primarily by clinicians, scientists have since added to the program, which substantively support the fact that since the process of module development is based on joint work, the learning objectives of basic science and clinical medicine should be sufficiently integrated. What encouraged the cooperation of

basic scientists and clinicians was that through seminars and workshop, there has been an increased understanding of the PBL program. Basic scientists as consultants have actively devoted themselves to the development of modules that complement the content of the regular curriculum of the first year class. They have also provided important points and given advice. In this way, quality improvements were evident through the development of the modules.

And third, how well did the students understand the PBL process? The training of tutors was pointed out to be the most important factor required for the success of PBL. In 1997 when the program was first introduced, the entire class was targeted, accordingly a large number of tutors needed training and the quality of the tutors was not assured. Since 1998, a comprehensive tutor training workshop has been made available to a small group of volunteers, and sufficient certified tutors are now available.

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