

Educational Reform: Problem-Based Learning at Chang Gung University, An Overview

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Problem-based learning is an educational method characterized by utilization of problems involving patients as a context for students to learn problem-solving skills and acquire knowledge about basic and clinical science. It is a core curriculum in the new pathway of educational reform. Chang Gung University and Chang Gung Memorial Hospital began a program of educational reform in 1998. However, many difficulties were experienced at the very beginning including the capabilities of students, manpower resources, and a transition period of implementation. After a series of communication, education, practice, and system reforms, the problem-based learning curriculum is now performing quite smoothly. This paper reviews the history of and our experiences with educational reform including preparation, implementation, the content and range of reform, accompanying package, committee establishment, tutor training, assessment of tutors and students, etc. The fact that our education reform began from clinical aspects and then progressed to basic medicine is unique, and a hybrid curriculum with a model of parallel progress in traditional and new curricula was created using internal medicine as a reference for other departments. Finally, we hope that the effect of well-designed reforms in facilitating learning should not be underestimated. (*Chang Gung Med J* 2002;25:716-22)

Key words: new pathway, educational reform, problem-based learning.

Planning Period

The educational reform of Chang Gung Memorial Hospital has been in preparation for many years, but a number of controversial points still exist. It was not until January 1999, when the former president of Chang Gung University, Dr. Chang Chao-Hsiung, sent directors from various departments, including the Director of Academic Affairs, and Chairman of the School of Medicine of the university as well as the Director of Internal Medicine and Director of Surgery from Chang Gung Memorial Hospital, to the University of British Columbia (UBC) to observe and obtain practical experience

with new educational methods, that educational reform formally began to move toward new methods of education.

My colleagues and myself have major responsibilities for the new curriculum, and we have had intense discussions on this topic. UBC provided us with valuable experiences and allowed us to identify potential serious errors, to reflect on the process, and to gain important perspectives. Since our experience at UBC consisted of a Western medical education,⁽¹⁾ we did not know if it was suitable for an Oriental medical system. That is why we have another team who will review the new Hong Kong University curriculum. A third team is visiting Singapore University, and will also participate in the first annu-

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al Asia-Pacific problem-based learning (PBL) conference. Analyses of the different systems and a diverse range of observations are the main goals of our planning.

Preparation Period

After various meetings and discussions, we set the direction of the new curriculum as follows:

1. Hybrid curriculum. Since the examinations to obtain a medical license or licensure in a particular specialty have not yet completely changed, to proceed and implement a PBL curriculum rashly is not appropriate. Conflicts between the entire social environment and physicians as well as the ability of students and teachers to adapt were important questions. Consequently, we adopted a model of parallel progress in both the traditional and new curricula in order to protect and develop accuracy and completeness.

2. Small scale. The expenditures in personnel and materials would be enormous to implement PBL across the board. Particularly in the early stages of implementation, there were many areas for which uncertainties remained. As a result, we decided to begin on a small scale, and slowly grow through experience.

3. Clinical focus. In the Chang Gung system, the clinical portion has always enjoyed more personnel and material resources than has basic medicine, so it was easier to promote and implement reforms starting in the clinical area.

4. Internal Medicine focus. The Department of Internal Medicine is the foundation of medicine, so the first step began with Internal Medicine. This can also serve as a reference point for other departments.

As a result, the fifth-year medical curriculum now includes Internal Medicine and other courses, with reduced time devoted to lectures. A greater proportion of time is spent on increased PBL and clinical practice. Clinical practice includes a morning meeting or other activities which use the PBL model.

There are nearly 4000 beds in the Chang Gung Memorial Hospital, Linkou, and each day the facility treats over 16,000 patients in our outpatient clinics. In theory, there should be ample material for clinical practice. In terms of the faculty as a whole, the clinical faculty is very important. There are 37 profes-

sors in the specialties, as well as 56 associate professors. In terms of numbers, there are 172 physicians in charge in Internal Medicine and 146 in Surgery. There are also 219 first-year (R1) to fifth-year residents (R5) in internal medicine and 160 in surgery. These are all important sources of instructors for our new curriculum. Each department is rather similar in terms of the number of beds, number of specialist faculty, and number of residents and physicians-in-charge. So not only can teaching be balanced, but also for this reason, it would be easy to promote the plan.

We began 3 years ago, first planning the PBL classrooms, with 12 at Chang Gung Memorial Hospital in Linkou, 1 at Chang Gung Memorial Hospital in Keelung and 28 at Chang Gung University, Taoyuan. These rooms have the following facilities: computer networks connected to Medline, overhead projectors, slide projectors, whiteboards, and all materials necessary for their use including the ability to immediately print out whiteboard contents. There is 1-way glass for tutor training use, which allows those outside to see what is occurring in the PBL room. A small-group approach is being used, with just 8 students and 1 tutor forming each group.

The promotion of educational reform requires a certain degree of integration. Our educational committee is divided into 13 smaller committees, for example, the medical education and curriculum committee, including the foundation course committee and the system-based block committees. Likewise, we also have a communications committee, a clinical visitation committee, a clinical techniques committee, a clinical practice committee, a resources and equipment committee, a testing and assessment committee, a special courses committee, a small-group guidance teacher committee, a basic techniques improvement committee, and finally a publications committee which publishes the entire PBL curriculum and results, as well as its experiences and reflections.

In June 1999, six months after we had returned from UBC, the Department of Internal Medicine completed the production of all teaching files for Internal Medicine. Taking cardiology as an example, the material is divided into 5-week blocks. Each week covers 1 case. Within these 5 cases, patient histories are designed to try as much as possible to

include all major cardiac diseases. If a disease is not included, it is covered by a lecture, and so the cooperation of all the cardiologists is required to compile each disease, based on X-rays and electrocardiograms, into a teaching file. After a file was completed, a committee identified what was missing and after appropriate changes were made, further reviewed it.

By July 1999, we had completed 3 sessions of tutor training. In this tutor training, tutors were chosen from among the ranks of associate professors or higher and those who had been physicians-in-charge for 5 years or longer. A tutor workshop was used to familiarize these people with the PBL process and to give them a feeling for the spirit of PBL. Currently, there are more than 60 tutors in our Department of Internal Medicine.

Teaching file committee

As to the teaching file committee, we ask all teachers to provide a specific guiding question when designing a teaching file. They should list all problems associated with this case, and during the first day's tutorial, show the students only the data within the squares. This includes the patient's age, gender, and chief complaint.

The content below the box is used by the tutors to design questions, which should include some hypotheses and so on. After the students have discussed the case for a period of time, we give the students the second block of data, which primarily deals with the detailed history and the results of physical examinations. At the same time, there are some guiding questions from the tutor. During the third phase of the discussion, the lab data are displayed, and students are allowed to continue their discussion. During the second tutorial, we show some pictures like peripheral blood smears, while giving students further data including terms that the students need to understand. We also provide other special data, for example on B12 or folate and so on, to help the students continue their discussion. At the third and final tutorial, some special tests, for example, homocysteine level and Schilling test results, are provided. This completes the case. After the third tutorial, the teacher who set up the question has a 1-class period wrap-up hour, to do a detailed review of the case.

Tutor training and workshop committee

Apart from the teaching files, tutor training is also of paramount importance.⁽²⁾ As we have described previously, we have many faculty who have been trained in the older educational system. Changing their original concepts is quite difficult. Consequently, to date we have held 7 tutor training sessions in Internal Medicine. During the course of PBL, the students interact with their tutor, and this interaction is broadcast outside the classroom via closed-circuit television. This material is useful for improving teaching. At the same time, we take turns inviting outside tutors to join us, and after experiencing the entire process, they are better able to grasp the comprehensive ideas.

A questionnaire from our hospital mainly focused on the views of new tutors toward the early stages of PBL. The results showed many inaccurate attitudes. For example: "PBL education uses a seminar format and asks the students to present a case or a problem on their own", was judged correct by 1/3 of the tutors. "In the PBL educational process, if a discussion or references consulted by a group's members contain errors, the tutor must make an immediate correction and help the students understand the correct information" was also judged to be correct by 1/3 of the tutors. The statement "For a PBL case, often the students can be told the focus of discussion for the case before class and asked to prepare, and during class time, the students can be asked to engage in a complete and thorough discussion to reach the planned educational result" was thought correct by more than half of the tutors. Therefore, this shows that before becoming tutors, most teachers had wrong concepts. So how can we correct the ideas of these teachers and make the PBL process easier?

Naturally, we hope that our teachers will clearly understand the goals of problem-based learning,^(3,4) and then they can evaluate and manage problems, identify learning issues, and seek resources; so we mainly begin by allowing the cases used to clearly show problems. This helps guide students toward self-directed study after which they will gradually be able to identify critical learning resources, apply that learning, and ultimately integrate it.⁽⁵⁾ Last, they will be able to use these features to understand the real nature of the entire case.

Therefore, we must first identify a problem and sort it out.⁽⁶⁾ Second is the problem itself. There

must be a hypothesis,⁽⁷⁾ and students must be allowed to follow the problem to provide a hypothesis for everyone to discuss. The third step is also very important. It provides each problem and the hypotheses with a mechanism, so that the hypotheses can be understood. The fourth step provides students with some information, or releases some information to them. The most important thing is that the students must test the hypotheses they themselves have brought forth and not just be fed information by the tutor. Therefore, after these learning issues are formed, the students are allowed to go home to do their homework which they bring to the second presentation.

Implementation Period

Clinical medicine implementation phase

When the new pathway educational reform reached the implementation stage, we split it into 2 phases of Clinical Medicine and Basic Medicine. At Chang Gung Memorial Hospital, even with educational reform, lectures we have always used have been retained, and lecture time occurs every day from 16:00-18:00, Monday through Friday. On Monday mornings, the fellow should orient the clerk. On Friday, there must be interaction between the fellow and the clerk so that the results of the week's study can be understood. We use the morning meeting model so the PBL model lets students hold free discussions and allows the Chief Resident to make a summation. Afterwards, we have a mini-lecture which presents a few procedures or some important information about Internal Medicine. We use these mini-lectures to provide supplementary material. The most important aspect of PBL is the case conference, which we hold during the first class period every Friday. On Saturday and Sunday, students are allowed to go home and prepare. The second class is on Tuesdays, and on Wednesday there is a final tutorial followed by a wrap-up session, at which the faculty member who gave the question does a general summation. Naturally, these tutorials come with an evaluation form. We hope that the tutors will maintain a very comfortable environment for PBL, and that discussions should be interactive and not disruptive. This allows students to make subjective judgments and gain clinical insights, which later encourages them to perform critical evaluations to support

their hypotheses. At the same time, we hope that the teachers are able to promote active and responsible communication, including letting the students know about outside information and encouraging the students to appropriately explain the tutorial information, as well as to thoroughly understand the terms and concepts.⁽⁸⁾ Tutors should also encourage students to refine the learning issues so that they can be guided in how to find resources.

Additionally, we hope that these teachers will facilitate teamwork and that they will try hard to avoid guiding everything.⁽⁹⁾ They should let the students learn from their own mistakes. This helps students identify problems and lets each member participate in the group. It promotes constructive feedback. Therefore, at the conclusion of each PBL session, the teacher will give an opinion as to the performance of each student in that day's session; the teacher also hopes that each student will give an opinion of the teacher.⁽¹⁰⁾ At the same time, there is also this kind of feedback communication each month and each semester. This helps us understand the actual results of our program, whether or not anything is missing, and what we should change in the future. In terms of students, we should be able to carry out a proper evaluation of the students' knowledge base, communication skills, reasoning, and assessment skills and give them a score.

The actual PBL assessment is based on participation, preparation, communication, critical thinking, and group skills, all of which are weighted to give a final score with comments.⁽¹¹⁾ Previous outpatient department (OPD) training was done in the fifth year, while in the new curriculum, OPD training begins in the third year. Consequently, this will allow each student to enter the clinical realm earlier in his/her education, and clinical education can show students how their teachers approach patients and how they do various things. This is very helpful towards their future clinical experience. Therefore, we are using small, 4-student groups each of whom sees 4-8 patients at 1 clinic. We also stipulate that the physician in charge must be an associate professor or higher-level faculty member and must have no other work scheduled for that time period so as to give his/her full attention to the guidance of the OPD students.

Moreover, our Department of Internal Medicine also publishes a Medicine Update and the Medical

Newsletter of Chang Gung Memorial Hospital, which lists items about the tutorials, PBL preparations and implementation, and everyone's reactions and responses. We are also issuing booklets including residents' passports, academic calendars, publications, translations, and so on.

Basic medicine implementation phase

In terms of Basic Medicine, the move to new methods began later.⁽¹²⁾ At Chang Gung, there are 15 full-time professors teaching Basic Medicine. There are also 23 associate professors. In Basic Medicine, the outline of the plan was mainly promoted during the 2000 academic year to new students in the Western and traditional Chinese medicine programs. During the second semester of the fourth year, PBL education will be implemented primarily through systematic integration into the Basic Medicine curriculum. This is because the third and the fourth years are the foundation of Basic Medicine, and by the second semester of the fourth year, the students have a solid enough foundation to begin working in small groups and to gradually expand their scope. The original time spent in Basic Medicine classes has shrunk by 1/3, while humanities medicine and information medicine coursework has been increased.

In order to adapt to the new curriculum from the first year, we begin with library information, English conversation and listening practice, computer practice, and advanced English. In the third year, there is medical information⁽¹³⁾ and computer technology, and in the fourth year, principles of management, regulations, and similar courses. The library information course principally allows students to understand how to use and search for information in the library, how to use search techniques, and how to search for information in open catalogues and information databases. Content includes use of Medline and so on. These allow our first-year students to be able to understand the methods of searching for information. At the same time, the curriculum provides a strong grounding in the humanities of medicine, including introduction to death, the human life cycle, medical view of life and death, near-death experiences, suicide, and the views on life and death in various religions.

The second-year curriculum stresses patient and social courses, including the art of the bedside man-

ner, depression, principles of medicine, how to discuss technical medical topics in a simple manner, physicians and the law, and the roots of medicine. The courses taken during the second year also stress interpersonal relationships and communication. Therefore, the curriculum includes special topic lectures, topics on people, land and society, medicine, the humanities, and so on. There are also group reports, which allow students to discuss topics among themselves and understand the relationship between the profession, loved ones, family, life, and values. Through this small group interaction, we nurture students' basic communication abilities.

In the sixth year, there are symposia on the Hippocratic oath, on patients' rights, the seriously ill, oral communication, and even recent well-known movies and television shows, including Emergency Room. After the sixth-year students watch these programs, they are required to write a report about their impressions. Other very important aspects include medical communication and medical disputes, doctor-patient relationships in primary treatment, problems and theories of patient care, improper treatment, medical ethics, teacher-student ethics, changes in technology and computerization, and how the role of the doctor will change under the impact of medical insurance. These courses are all emphasized during the sixth year of training. In the area of medical ethics, courses include various aspects of doctor-patient relationship and the rights of patients, human subjects, questions pertaining to abortion and test-tube babies, organ transplants, euthanasia, and so on, all of which receive strong emphasis.

Feedback on the New Pathway⁽²⁾

We give a series of questionnaires to our students and teachers on the implementation and process of educational reform. Our statistics primarily focus on students in the Department of Medicine at Chang Gung University. Currently, these students are interns, and because this is their first experience with the PBL process, we hope to be able to understand their feelings and experiences throughout the entire process. The results of this survey are analyzed in subsequent papers.

Consequently, we can sum up by saying that in the new medical school curriculum, our first- and second-year students are defined as being engaged in

general education, but we stress humanities and most importantly of all methods. This education includes instruction on computers and the library, to teach students how to obtain information. Moreover, it is very important to raise the students' English ability. The third- and the fourth-year curricula feature basic medicine, principles of medicine, integration between basic and clinical medicine, clinical studies, and clinical techniques. The fifth- and the sixth-year curricula are devoted to various aspects of medicine, clinical integration, doctor-patient relationships, medical ethics, and clinical education. The seventh year is a clinical internship. Furthermore, various functional committees in internal medicine monitor the overall medical education process including a monthly meeting of professors and chairman in the Internal Medicine Department, the Internal Medicine medical teaching committee, and the Internal Medicine publications committee; all of these committee meetings deal with the content to be taught, the environment, process, and results.

Consequently, the major direction of our new way of thinking is humanity-based, student-centered, problem-driven medicine, with proactive study, small group teaching, diversified elective courses, and life-long learning. We hope that we can exert a subtle influence on the character of medicine and exchange our experience with others to allow further improvements in medical education in Taiwan.

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