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Review Article

Development and Modification of Active Learning Based on Qualitative Educational Research

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ABSTRACT: Today, as a result of university education, "What have students acquired?" is asked, rather than "What have they been taught?" In the Toho University Faculty of Medicine, problem-based learning tutorial has been introduced and implemented since 2006 as an active learning program. The speed of change in education is extremely fast, and if the changes in our education cannot cope, it will be left behind. At the Medical Education Center, we are continuously developing and examining methods of learning and teaching for curriculum modification and introduce the efforts. Active learning is not difficult at all, and there are many easy ways to do it. We think that it is important to carry out the development and practice of educational techniques while making use of faculty development for lectures and workshops etc. In this article, we describe how future medical education should be conducted, focusing on efforts made at the Center for Medical Education.

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Introduction

In the overseas requirements for physicians, the Royal College of Physicians and Surgeons of Canada, for example, lists six abilities to be acquired: "Professional," "Scholar," "Health Advocate," "Leader," "Collaborator," and "Communicator".[1] The Accreditation Council for Graduate Medical Education in the United States also lists six attributes to be acquired by a physician, as follows: "Medical Knowledge," "Patient Care," "Professionalism," "Interpersonal Communication," "Practice-based Learning: Personal Improvement," and "System-based Practice: System Improvement".[2] In Japan, abilities to be acquired have not been specified; however, nine basic qualities and abilities required of a physician were clarified in the Medical Education Model Core Curriculum (2016 revised edition) [3] (Fig. 1). The knowledge domain has only two types of medical knowledge, and other things are required to be practiced. Traditional knowledge teaching classes may not be enough for medical learning.

Today, as a result of university education, "What have students acquired?" is asked, rather than "What have they been taught?" The society requests universities to "develop useful human resources in the society" and seems to be more sensitive to the educational outcome:

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Fig. 1 Actual photo of problem-based learning (PBL) pilot study in 2015.

"What kind of human resource development has been conducted?" The College of Arts and Sciences of the University of Tokyo introduced active learning in the academic year 2007. In a questionnaire on the degree of educational achievement in 2007, 75.5% of students answered that they had "acquired" or "somewhat acquired" knowledge, while only 46.4% answered they had "acquired" or "somewhat acquired" the ability to act voluntarily.[4] In 2018, the percentages increased to 85.8% and 60.7%, respectively.[5] The introduction of active learning may have been effective not only for knowledge but also for voluntary action.

Active learning is a learning method for students that emphasizes active participation in classes, such as small group discussions or examination of problem-solving processes, rather than only listening to lectures. Bonwell and Eison defined active learning as "anything that involves students in doing things and thinking about the things they are doing".[6]

The conventional lecture style has advantages, such as being able to give classes to many students in a large lecture room easily. Also, by transferring objective knowledge from teachers to students unidirectionally, it can effectively convey a systematic knowledge system. Active learning, by contrast, includes a process to generate knowledge, and students experience a process where subjective opinions have led to objective knowledge through dialog. The participating students can experience all positions, which are not only subjective positions but also positions where you can see things in an all-purpose manner through discussions. In this article, we describe how future medical education should be conducted, focusing on efforts made at the Center for Medical Education, where we have been trying to make problem-based learning (PBL) through tutorials, the key to more effective active learning in our university.

Contents of Our Work

In the PBL process, students find problems based on cases and solve them by themselves;[7] thus, PBL is thought to be useful to acquire new knowledge and experience at the same time. The tutorial is an educational form to put PBL into practice and requires the participation of teachers (tutors) who assist our medical students by providing appropriate preparation for learning and being involved.

In 2006, our university introduced PBL tutorials to foster an active learning attitude in students. "Learning how to learn" was posited as a major pillar in the basic medicine PBL tutorial, and "improving clinical reasoning abilities" was a major goal in the clinical medicine PBL tutorial. PBL tutorials have continued for more than 10 years since then, allocating a tutor for seven to eight students. However, at the meeting of the Japan Society for Medical Education in 2015, medical students posed a problem: learning effects were inadequate because of insubstantiality and inefficient procedures of PBL.[8] We considered that our university was no exception and examined three factors: 1) the students, 2) the teachers, and 3) the PBL system. As one of the reasons, we considered that students regarded repeated discussions on an issue as a repetition of the same work, and thus their motivation for learning decreased. We decided to start with an improvement in the education system and establish a program that fosters a feeling of academic achievement in students.

In 2015, a pilot study was conducted with 17 students, ranging over multiple academic years, using the clinical reasoning PBL tutorial with the participation of simulated patients (SPs) (Fig. 1) (Ethics Committee of Faculty of Medicine, Approval No. 26088).[9] There was no statistically significant difference in the level of satisfaction between PBL tutorials with and without SPs. The students' opinions, expressed in free descriptions, suggested that they felt a sense of tension before attending classes, had a feeling of realism, and made efforts to consider how to deal with patients in the PBL tutorial with the participation of SPs. Thus, the usefulness of the PBL tutorial with SPs to be high (Table 1).

On the basis of this data, a new type of clinical reasoning PBL tutorial with SP participation was performed as

Table 1 Levels of satisfaction after problem-based learning (PBL) with and without simulated patients (SPs), and free description in the pilot study in 2015.

	1: Extremely Unsatisfied	2: Unsatisfied	3: Somewhat Unsatisfied	4: Somewhat Satisfied	5: Satisfied	6: Extremely Satisfied	Mean ± SD	*P*-Value
With SPs (the number of respondents)	0	0	0	0	12	5	5.29 ± 0.83	0.248
Without SPs (the number of respondents)	0	0	0	3	6	6	5.06 ± 0.47	

PBL tutorial with SP	There was a feeling of tension, and the discussion heated up Focused on explaining to the simulated patient
PBL tutorial without SP	As usual There was also a part that became flow-oriented I could learn more about the disease state and knowledge

SD means standard deviation.

Table 2 Levels of satisfaction after problem-based learning (PBL) with and without simulated patients (SPs), and free description in the study in 2016.

	1: Extremely Unsatisfied	2: Unsatisfied	3: Somewhat Unsatisfied	4: Somewhat Satisfied	5: Satisfied	6: Extremely Satisfied	Mean ± SD	*P*-Value
With SPs (the number of respondents)	1[a)]	1[a)]	6	31	35	17	4.62 ± 0.97	0.106
Without SPs (the number of respondents)	0	0	7	25	40	19	4.78 ± 0.87	

Reason for unsatisfaction: Because time is taken for study of test.
The time is bad.

PBL tutorial with SP	There was a feeling of tension, and the discussion heated up Positive sense of knowledge acquisition Recognize my lack of ability Larned a lot about communication
PBL tutorial without SP	Acquisition of knowledge through case scenarios Efficient learning I could learn more about the disease state and knowledge

SD means standard deviation.

a part of the regular classes in 2016 (Ethics Committee of Faculty of Medicine, Approval No. 27065).[10] We conducted clinical reasoning PBL, both without SPs (that is, the conventional type) and with SPs, for the third-year students of the Faculty of Medicine. After each PBL, we compared the learning evaluation of the PBL tutorial with the results of the questionnaire on the level of satisfaction and the reasons for it. Although there was no statistically significant difference in the level of satisfaction in classes, the reasons for the level of satisfaction were different. In the SP participation type, the students gave a sense of tension and a feeling of realism as their reasons for the level of satisfaction (Table 2). It was suggested that the participation of SPs in the PBL tutorial was one class method that could resolve the insubstantiality of classes. On the other hand, from the perspective of knowledge acquisition through a scenario, sufficient educational effect seemed to be obtained through conventional PBL. In 2018, we conducted an SP-participation clinical reasoning PBL tutorial that incorporated the practice of consultation with a simulator, and the results are currently being analyzed.

To improve classes and curricula, we are required to plan improvement measures based on the review of implementation and build new classes. Classes and curricula have to be designed on the basis of the so-called plan-do-check-act (PDCA) cycle. This cannot be achieved overnight; it must be implemented under a long-term

Table 3 Important check points when conducting a curriculum evaluation.

1) Why do you evaluate?
2) Who is the evaluation for?
3) What do you evaluate?
4) How would you evaluate it?
5) Who will evaluate? / Who do you get information from?
6) When do you evaluate?
7) How do you use the evaluation results?

plan. First, we will plan and implement the collection of qualitative and quantitative data for evaluation from the time of planning classes and curricula. Subsequently, we should establish a system to continuously improve classes and curricula by examining and clarifying points of superiority and points to be improved separately for purposes and policies. In fact, we have spent five years from the planning stage in formulating the class plan presented at this time, and we have been making improvements in a step-by-step manner while being aware of seven points considered important for evaluation (Table 3).[11] In addition, the PDCA cycle is considered "one of the most important tools to improve the individual processes of medical care" not only in education but also in clinical settings.[12] Therefore, it is extremely important that not only educators but also healthcare professionals develop improvement measures based on the review of implementation.

Goals for a Higher Education Institution

It has been pointed out, as a problem of university education in Japan, that learning hours outside classes are shorter than those in other Western countries. We conform to the class attendance time required by the Standards for the Establishment of Universities, namely 2.6 hours per day. However, self-directed learning hours (learning hours outside classes) are less than the 5.6 hours per day required by the same standards. The source of this data is the research on the actual learning situation of university students (2016),[13] which is a report covering all departments of Japanese universities. As to whether medical students satisfied the requirements for learning hours, it is reported that about 10% of students in medical sciences, dentistry, and pharmacy spend zero hours for preparation and review in a week, and 42% spend less than 5 hours. These results show a tendency that is lower than that of other departments, and it is difficult to say that students in the medical department have sufficient learning hours outside classes. It may be necessary to improve future learning methods.

We have been providing "early exposure education for clinical medicine where students voluntarily participate" to our first-year students for the past four years. After the simple lecture on medical interviewing and symptoms related to chest pain, the students were divided into groups of four, and a disease was allocated to each group. In the class, the students voluntarily learned about the disease that they were responsible for while being aware of the pathological condition; they presented the products and considered, prepared, and demonstrated a medical interview scenario for the content related to the disease. A questionnaire was administered thereafter for class evaluation. Almost 85% of the students answered that the learning hours they spent outside class on preparing for this class amounted to 60 minutes or more, and they highly evaluated the classes conducted by themselves, such as lectures and medical interviews, scoring them as high as 4.2 to 4.3 points out of a possible 5 points. Generally, there were many favorable opinions in the free descriptions, such as "increasing interest in medical-related learning," "more impressive than classroom lectures," and "want to try other symptoms." Although few in number, opinions were expressed, such as "It affected the learning time for other subjects" and "Only a few things were acquired in spite of hard work." Thus, future issues were clarified.

The fourth-year students formulated a mini-health course program using a humanoid robot equipped with artificial intelligence (Fig. 2), and we conducted an interview survey to grasp the specific learning and awareness of students.[14] The greatest number of comments was for content related to knowledge, and they were mainly about the student's growth and recognition of immaturity. In terms of content related to skills, many comments were focusing on thinking, such as selection of words to be understood by the other party and on creating a story with easy-to-understand content in the mini-health course program. Further, in terms of emotion, some students made comments such as being aware of improving their learning motivation or a sense of achievement.

The learning strategy of teaching each other, represented by peer instruction, is important to create a bidirectional relationship during a lecture and it is said to have a positive impact on learning compared with tradi-

Fig. 2 Actual photo of a mini-health course program at the Toho University Faculty of Medicine Open Campus in 2016.

tional teaching methods.[15] In addition, Palmer said "By separating teaching from learning, we have teachers who do not listen and students who do not talk".[16] Excessive teacher intervention should be avoided in small group education. In the future, it will be necessary to establish classes and curricula centered on classes that incorporate voluntary learning.

Summary

At the Faculty of Medicine, much active learning has been conducted, including basic medical training, diagnostic training and exercises, and clinical training. However, we cannot deny the possibility that the learning has been shallow despite high activity. Future classes at universities should improve content with high activity and deep learning. Active learning is never difficult,[17] and there are many learning methods that can be easily done in a large lecture room without much trouble, such as "questions in a lecture/dialogue with students," "walking around the class," and "Think, (Write,) Pair, and Share." We think it is important to develop and practice educational techniques while using faculty development, etc.

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