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Introducing novel learning methods to a pharmacy school in Japan: A preliminary analysis

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Abstract
Problem-based learning (PBL) and small group discussions (SGD) have gained the attention of many Japanese pharmacy schools as a new education tool. However, the effectiveness of these methods may be influenced by students' attitudes and culture. This paper describes how a School of Pharmacy in Japan has been piloting PBL and tutorial SGD sessions and reports results of a preliminary analysis of their efficacy as educational tools. The results showed that PBL and tutorial SGD could be valuable educational tools for Japanese pharmacy schools. Further research is suggested in order to confirm these results.

Keywords: *Pharmacy education, problem-based learning, tutorial small group discussion, efficacy analysis, Japan*

Introduction

In 2006 pharmacy education in Japan converted to a 6-year program from the previous 4-year program. The classic 4-year program focused on pharmaceutical sciences, such as drug design, drug synthesis and biomedical sciences with little clinical-oriented education. The need to teach clinical pharmacy had been advocated for many years and the new program encompasses this area. The new program was expected to cover pharmacists' roles in the field of clinical practice, in addition to the traditional curriculum that teaches basic sciences. Effective educational tools which advance student's clinical problem solving and communication skills, were urgently required for this new program. Previous reports from western countries suggested that problem-based learning (PBL) and tutorial small group discussions (SGD) are effective learning methods for pharmacy students to improve critical thinking, problem solving skills and communication skills required for clinical practice (Cisneros, Salisbuy-Glennon, & Anderson-Harper, 2002; Whelan, Mansour, & Farmer, 2002; Bratt, 2003; Cheng, Alafris, Kirschenbaum, Kalis, & Brown, 2003; Pungente, Wasan, & Moffett, 2003). These learning methods, however, are new in Japan and are still under development. In addition, there are few studies reporting the efficacy of the methods in Japanese schools of pharmacy (Kawakami, Mjiura, Adachi, & Takeguchi, 2002; Sekiguchi, Yamato, Kato, & Torigoe, 2004; Taniguchi et al., 2004; Sekiguchi, Yamato, Kato, & Torigoe, 2005). It is possible that students' activities and contributions during PBL and SGD sessions can be affected by the Japanese culture. For example, the Japanese, in general, are reluctant to provide personal opinions during group work (Sekiguchi et al., 2004, 2005; Thayne, 2004), and Japanese students have little experience of self-directed research or giving presentations in front of audiences. For these reasons, the real impact of the PBL and tutorial SGD methods on Japanese students is not known.

This paper is the first description of how PBL and SGD methods have been implemented in a Japanese pharmacy school, and presents both subjective and objective evaluations of the methods.

Method

Description of the pharmacotherapy course

The Showa University School has practiced PBL and tutorial SGD for several years in the pharmacotherapy

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course of the Masters degree program. The program has been developed by clinical pharmacists and expert faculty staff to produce qualified pharmacists in the field of clinical practice. The pharmacotherapy course is taught over 4 months and consists of the following three components: evidence-based medicine practice, SOAP note-writing (a problem solving system) and pharmacotherapy planning (in seven units: diabetes mellitus, asthma, myocardial infarction, renal failure, liver cirrhosis, Parkinson's disease and colorectal cancer).

At the beginning of each unit, a clinical case is presented to students. Students are given information such as past medical history, lifestyle factors, family history and clinical test data. Following a day of independent reading by students, physicians and clinical pharmacists give a short lecture about the case to the students, including a background of the disease and the basis of pharmacotherapy. After the lecture, students begin reading assignments and self-directed research to prepare for the SGD, using all available resources, such as guidelines and information from the Internet. Three days later, students present their solutions for the problems associated with the case study in a tutorial SGD. Each discussion group consists of seven or eight students and a tutor. Students are required to reach a consensus on the best treatment. The SGDs are self-directed and tutors do not contribute to the discussion. Instead, tutors facilitate discussions in an appropriate way.

The next day, students conclude the discussions in their groups, and have the opportunity to present their conclusions in front of the other groups. The presentation is an open discussion involving the entire class, tutors, physicians and pharmacists. This is a very unique part of the Masters program where students can discuss treatment regimes with an expert physician and obtain comments from a pharmacotherapy specialist.

Self-reported data

Self-reported data were collected in two ways. The first was students' self-evaluation of performance and the second was a questionnaire relating to students' views of the course and its learning methods.

Student self-evaluation of performance

Participants. The study participants were first-year students of the Masters degree program in 2004. All students were graduates of the traditional undergraduate program, except for two who had work experience as pharmacists (one had been working for 2-years as a hospital pharmacist and the other had been working for 1-year in a community pharmacy). The self-evaluation was conducted as a part of the course requirement.

Measures. A 24 item questionnaire was developed. Items related to student's performance on specific behavioural objectives of the pharmacotherapy course. The questionnaire covered three areas: the overall pharmacotherapy course (8 items, such as understanding pathophysiology of diseases, side effects of medication, identifying therapeutic goals); evaluation of the problem solving exercises (9 items, such as ability to extract clinical problems from case study, ability to assess information from case study); and evaluation of the evidence-based medicine exercises (7 items, such as ability to explain concepts like relative risk, ability to assess results from clinical trials). Participants responded to the items on a five point scale (1, very poor; 2, poor; 3, average; 4, good; 5, very good).

Data collection. The questionnaire was completed twice: at the beginning of the course and when students had completed the course. Differences in responses between the two evaluations were analysed using Wilcoxon rank sum tests.

Survey of student satisfaction

Participants. Participants were recruited from the same student group as those in the self-evaluation study. At the time of recruiting, students were informed that the study was voluntary, confidential, anonymous and would have no effect on their grade.

Measures. The questionnaire consisted of 10 items some of which were open ended and some in a ranked ordinal format (e.g. 1, very poor; 2, poor; 3, average; 4, good; 5, very good). Items related to students' satisfaction, quality of course components and feedback for the tutorial SGD learning.

Data collection. Participants completed the questionnaire after the last session of the course had finished.

Objective data

Student's treatment plans and notes from one case study were used as objective data with which to evaluate the success of the novel learning methods.

Participants. Students were recruited from the same student group as those in the subjective studies. They were informed that participating in the evaluation was voluntary, confidential, would have no effect on their grade and that they could withdraw at anytime.

Examination. Students were given 1 h to write their pharmacotherapy plan for the clinical case given. The case used for the evaluation was a diabetes mellitus patient. Students' names were anonymised when answer sheets were collected and replaced with numbers in order to prevent bias and ensure confidentiality.

Table I. Example of check list items.

Knowledge				Writing technique	
Subjective patient information	Diagnosed with diabetes mellitus when young		✓	Assessment and plan corresponds to subjective and objective data	✓
	Taking sufficient exercise		✓	Describes observation plan, care plan and education plan	
	Not overeating			Short- and long-term goals are set	✓
	Going for a drink with friends			Written in simple and understandable way	✓
	Thirsty		✓	Guidelines are evaluated and applied to the case	
Objective patient information	Risk factor information	Blood pressure	✓	Problems are solved in an appropriate order of priority	✓
		Total cholesterol	✓		
		Total glycerol	✓		
		Height			
		Weight			
		BMI	✓		
		Smoking status	✓		
		Age	✓		
	Medication	Glibenclamide	✓		
		5 mg BID	✓		
		Pravastatin	✓		
		10 mg QD			
	Information to evaluate efficacy of medication	BS			
		IRI	✓		
		HbA1c	✓		
		Volume of urine			
		Weight			

Measures. The notes were evaluated and scored using a check list (Table I) developed by the researchers in order to minimize scoring variance between evaluators. Students were evaluated on their knowledge relating to the case study, and their note-writing technique according to the patient-oriented system. Points were given each time the student included an item in their notes which corresponded to the check list. For example, three clinical problems should have been listed by students. One point was given for each problem listed. Subjective information (i.e. that given by the patient, such as thirst) carried a maximum of five points, objective information (such as blood pressure) carried 26 points, assessment carried 26 points, goal of treatment carried 10 points, and pharmacotherapy planning carried 68 points. A maximum of 7 points was given for the note-writing technique, such as appropriate and comprehensive description of care plan.

Data collection and analysis. The evaluation was conducted shortly after students enrolled onto the Masters program and again 6 months into the program.

Differences in points between the two time points was compared and analysed using *T*-tests. The first three cases were evaluated by two researchers and results were compared. Differences were discussed and agreed upon. Subsequent scoring was conducted independently.

Results

Self-reported data

Student self-evaluation of performance. Of 32 students available, 28 students completed a self-evaluation of performance. The mean total scores (with a maximum of 5 points) of students' self-evaluation are presented in Table II.

The differences between the scores before and after completing the course were all statistically significant ($p < 0.01$).

Survey of student satisfaction. Results are shown in Table III. Twenty-seven out of a potential 32 questionnaires were returned (response rate 84.4%). Eighty two percent of the subjects answered that the behavioural objectives set for the pharmacotherapy course were adequate and helpful to learn in the course. Although 63% of participants considered that the cases and problems presented in the course were somewhat advanced and difficult to understand, 92% were able to complete the course with satisfaction.

Table II. Mean total evaluation scores before and after the Masters program using novel learning methods.

Evaluation	Before program (mean ± standard deviation)	After program (mean ± standard deviation)
Pharmacotherapy course overall	1.6 ± 0.7	3.4 ± 0.7
Problem solving exercises	2.0 ± 1.0	3.7 ± 0.7
Evidence-based medicine exercises	1.5 ± 0.7	3.6 ± 0.8

For questions regarding the tutorial SGD method, 78% were satisfied with the learning method, while 22% answered that group discussion was not useful for them. In addition, a vast majority (97%) developed an interest in pharmacotherapy at the end of the course.

Objective data

Three out of 32 students withdrew from the study due to absence from the second exam (two students) and voluntary withdrawal from the study (one student). Figure 1a presents the results of the objective data analysis. The mean total score for knowledge increased from 42.3 ± 8.7 (mean ± S.D.) to 76.6 ± 17.0 ($p < 0.01$). The mean total score for note-writing technique increased from 2.21 ± 0.91 to 4.40 ± 1.17 ($p < 0.01$). The scores broken down by categories within the check list are presented in Figure 1b. With the exception of the first two items (listing problems and subjective information), all scores increased significantly from baseline ($p < 0.01$).

Further analysis to investigate the educational effect of the novel learning methods was also carried out (Figure 2). Students were grouped into three levels of performance according to the score of their first assessment. The "low score" group scored a mean of 22.7 (± 2.62, $n = 8$). The "middle score" group scored a mean of 30.4 (± 2.07, $n = 11$), and the "high score" group scored a mean of 37.7 (± 2.41, $n = 8$). Scores at the second time point were significantly higher in all three groups, increasing to 50.3 ± 13.5 in the poor score group, 61.7 ± 5.79 in the middle score group and 53.7 ± 13.0 in the high-score group ($p < 0.01$).

Discussion

In this study, both the self reported and the objective data showed that PBL and tutorial SGDs improved students' clinical skills and abilities. In particular, the objective data suggests that the tutorial SGD can be a very effective learning method to improve not only clinical problem solving skills, but also the technique of writing clinical notes. The results from the self reported data support the positive outcomes from the objective data: students themselves also believed they had improved their knowledge as well as their note-writing technique. It was also clear that students were satisfied with the course and that this style of learning improved their motivation and confidence as a clinical pharmacist.

However, students scored lower than expected when objectively assessed after the course. It is possible that the assessment method, the checklist, was pitched too high, although tutors had initially expected students to demonstrate knowledge of the points listed by the end of the course. Another possible explanation is that some tutors may not have had sufficient clinical experience to lead the students' discussion effectively. Some tutors were not able to fully contribute to the discussion which may have affected students' learning. The role of the tutors in SGDs is important in order to lead the discussion in an appropriate way and to achieve the learning outcomes (Whelan et al., 2002). The establishment of a tutor development program fostering effective SGD facilitators is a possible solution.

In the student satisfaction survey over half of students showed a high-level of satisfaction with the learning methods, and over three-quarters reported positive feelings towards SGD learning. Students also believed that the SGDs enabled them to discuss effectively, and improve their ability to formulate and present their personal opinions. These improvements in communication skills have also been reported previously (Cisneros et al., 2002; Whelan et al., 2002; Pungente et al., 2003).

Table III. Student responses to satisfaction questionnaire (%).

	Very easy	Easy	Average	Difficult	Very difficult
How do you rate the degree of difficulty of this course overall?	0	0	37	56	7
	Very good	Good	Average	Poor	Very poor
How do you rate your understanding of this course overall?	0	48	44	7	0
How do you rate tutorial SGD learning?	15	41	22	22	0
	Strongly agree	Agree	Average	Disagree	Strongly disagree
I want to learn more about pharmacotherapy	56	41	4	0	0

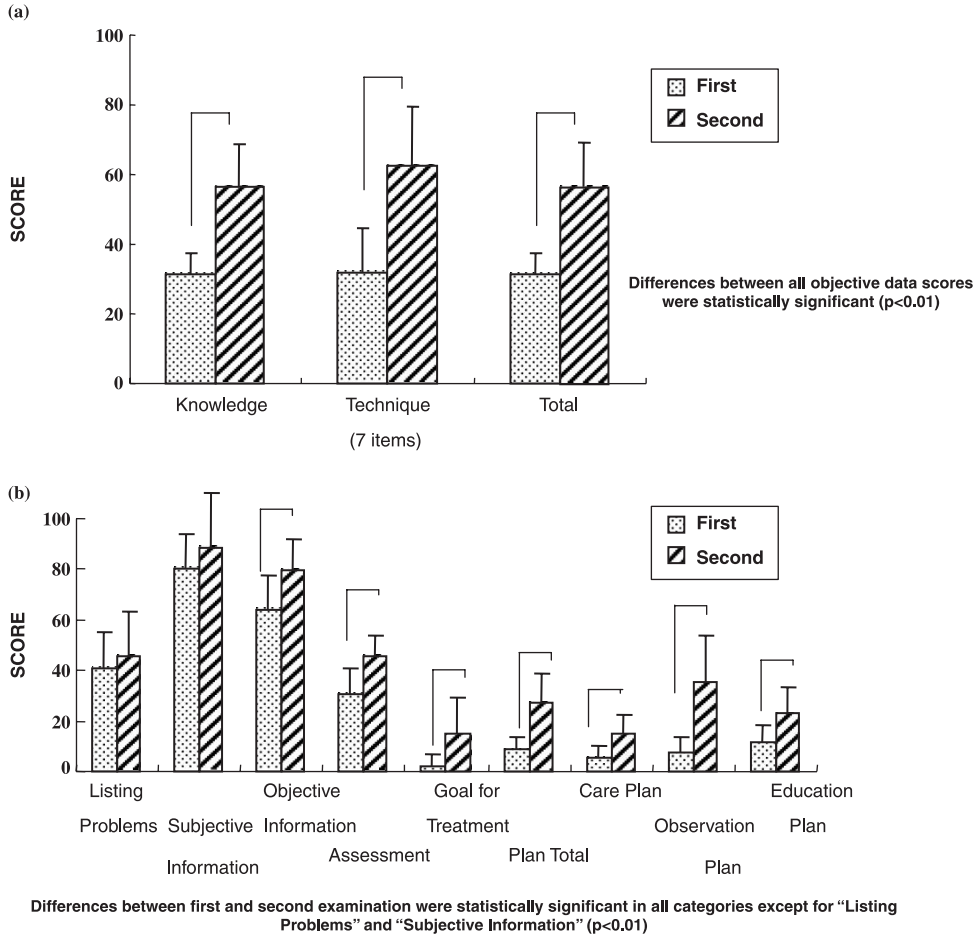

Figure 1. a: Objective data scores, b: Objective data scores by category.

Conversely, over one fifth of students claimed that they did not find the SGD learning method useful. Reasons given were, for example, that discussions tended to dissolve and failed to reach a consensus, that there was not enough time to present one's opinions, and that discussions tended to be dominated by a minority of students. It is argued that some of these difficulties may be due to traditional Japanese teaching styles and culture. Japanese schools traditionally have a strict discipline which requires students to sit quietly and listen to lectures in a large classroom. Students have little opportunity to give and discuss their opinions with others. In addition, the Japanese do not easily express their beliefs and emotions. These factors could prevent students from giving their personal opinion and holding constructive discussions.

In reality, clinical pharmacists must have strong communication skills in order to work effectively and competently within their medical teams. Students, therefore, should actively participate in SGDs despite their previous experience and cultural background. Introducing PBL at the undergraduate level and increasing the number of discussion-style classes may encourage students to acquire these skills.

Despite two-thirds of students reporting that the cases and problems presented during the course were somewhat advanced and difficult to understand, the majority felt that they could complete the course successfully. It is possible that by setting a higher goal, students' motivation is greater. The small group setting allows students to ask questions, discuss issues with colleagues and CWC success.

Further analysis showed students improved their scores regardless of their original scores. When the degree of improvement in each group is compared visually the increase in the low and middle performance groups is particularly noticeable. In addition, scores from the second assessment became more similar. This suggests that regardless of the initial level of knowledge and writing ability before the course, all students benefited by PBL and tutorial SGD methods.

There are some limitations to this research. Firstly, the same students were assessed before and after the course. Although there was 6 months between the assessments, one cannot exclude the possibility that students could recall their responses of the first examination at the time of the second. Second, the

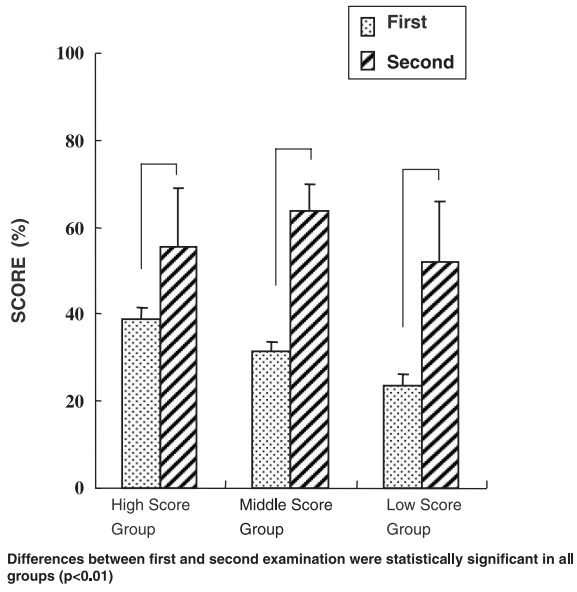

Figure 2. Objective data analysis according to scores at first examination.

sample size is relatively small and the results of this study may not truly reflect the effect of the novel learning methods. Further studies, such as conducting comparisons between PBL and traditional programs using a larger sample, are needed.

Conclusion

Although further research is needed, our study showed positive outcomes of the tutorial SGD where students at all levels were able to improve not only their problem solving skills but also motivation and confidence. The results indicate that the PBL and tutorial SGD can be useful learning methods to improve clinical problem solving skills in Japanese pharmacy school students. In order to further increase the benefits of the PBL and SGDs learning methods changes such as improving the course content, establishing a tutor development program, and introducing the learning methods at the undergraduate level could be implemented.

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