



The Effects of Problem-Based-Learning on the Academic Achievements of Medical Students in One Japanese Medical School, Over a Twenty-Year Period

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Abstract

Purpose: This investigation considered the cognitive outcomes, expressed by the academic achievement scores in basic and clinical sciences and the National Licensing Examination results of medical undergraduates.

Method: Cognitive outcomes were compared using the academic achievement scores in basic and clinical science and the National Medical Licensing Examination pass rates, during the two periods pre- and post-PBL.

Results: The scores, were significantly higher post-PBL. Scores in clinical science were significantly higher in both male and female students post-PBL. Before PBL, the scores for female students were higher, whereas no difference between males and females was observed post-PBL.

Discussion: The results suggest that PBL is equal or superior to the traditional methods of developing cognitive ability. A superior pace of knowledge acquisition by male students after PBL was observed. This supports the hypothesis that PBL is a suitable education model for Confucian countries in place of predominantly classical teacher-centred education.

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Keywords: Cognitive outcome; Japan; Long-term trend; Problem based learning; Undergraduate medical education

1. Introduction

In 1984, The World Federation for Medical Education, in collaboration with the World Health Organization initiated its on-going programme of global reforms in undergraduate medical education.¹ The impact generated a number of national developments in both the content and the educational principles,² the most significant being

recognition that a medical doctor should be skilled in autonomous, or self-directed learning, equipped for a life-time of clinical practice. Arising from the debate as to how this might be achieved, evidence that problem-based-learning (PBL) had a significant role to play was widely endorsed.^{3–6} In 1995, after careful consideration of the evidence, Gifu University Medical School (GUSM) adopted a PBL curriculum within an organ-system curriculum structure, with the first cohort graduating in 2000.

Since 1990, there have been numerous reports on PBL from Western cultures, reporting mixed conclusions of its merit.^{7–9} However, the outcomes of PBL in Asian countries remains controversial,¹⁰ and the debate

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continues as to whether PBL is effective in East Asian countries, where a traditional teacher-centred Confucian learning style, is prevalent. The influence of cultural attributes on PBL in a non-Western setting is also controversial.¹¹ The conventional Confucian style of teaching is one of formal didactic, teacher-centred instruction, prevalent in formal institutions. However, in Japan, clinical medicine has, historically, been learned through a case-based, apprenticeship approach.¹² Therefore, the assertion is that PBL can be applied in a Japanese cultural context, by employing appropriate clinical and culturally sensitive approaches.

It is generally acknowledged that evaluation of PBL is a challenge with respect to validity and reliability.^{9,13} However, this paper reports on the academic results between 1990 and 2009, and makes a comparison with the national results. The authors believe that the nature of the data is sufficiently specific and sensitive to provide the basis for a robust analysis. The study focuses on four main themes; gender, content, examination results and some psycho-social issues.

1.1. Gender

A consistent finding in the literature is that female students tend to perform better than male students in their medical training and are more likely to attain an honours degree.¹⁴ Female gender has been found to be a positive predictor of clinical reasoning scores in a PBL medical programme.¹⁵

1.2. Content

The literature has mixed reports of basic science results and PBL. Whilst it was reported that PBL was more effective than traditional didactic methods in biochemistry.¹⁶ This was not the case for teaching anatomy.¹⁷ This suggests that the effectiveness of teaching basic medical science may be dependent on the institution/learning environment. Japan has a long tradition of basic science-oriented medical education,¹⁸ and there is speculation that PBL may lead to the decrease of knowledge in basic medical science.

Whilst no difference was reported between PBL graduates and conventional students,^{19,20} in the literature about clinical competencies, there is evidence of a positive effect on social and cognitive domains.⁹ We have previously reported that communication skills, commitment and attitude toward clinical clerkship in the 5th years (in the university hospital) and 6th academic years (in the community hospitals) were both significantly better than those of non-PBL students.^{19,20}

1.3. Examination results

Enarson²¹ reported no difference in the results of USMLE between students who received PBL curricula and those who received traditional lecture-based curricula, while other reports indicated better outcomes in USMLE.^{22,23}

1.4. Psycho-social issues

Psycho-social influences include students' preferences in choosing a school, the University admission's criteria, nature of curriculum reform, assessment, cultural and attributes. The factors that influence students' choice of medical school, and the University admission procedures remain basically unchanged, and there was no obvious selection by students, or for students, for a PBL approach.

1.5. GUSM curriculum overview

In 1947, GUSM adopted a 6-year medical programme which was broadly similar to those of other Japanese medical schools, following the Confucian style of subject-based, formal teaching, with an emphasis on the acquisition and retention of knowledge by passive learning.

In 1995, a revised curriculum adopted an organ-based structure with 21 integrated modules, including, "The Human Body", "Metabolism and Functions", "Pharmacology and toxicology", "The Gastrointestinal system", "Cardiovascular system" and "Growth, development and genetics".

Students meet in groups of 8, for an hour, 3 times per week and discuss a Faculty selected patient-based problem case, in the presence of a tutor. Additional learning opportunities are arranged in the form of related lectures, laboratory work and practical, skills teaching, self-directed learning hours, and private discussion-time are scheduled within the course.

1.6. Assessment

The scores of internal and National examinations of GUSM students were considered. Internal examinations were set at the end of each of four pre-clinical modules and 6 clinical modules.

All students enter the national Japanese Medical Licence Exam (JMLE), which follows the style of the USMLE. It is a rigorous examination, taken over three days, at the end of Year 6. Five hundred items of multiple-choice questions (MCQ) are set, covering a

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