A Model of Small-Group Problem-Based Learning In Pharmacy Education: Teaching in the Clinical Environment

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Abstract

Problem-based Learning (PBL) is an alternate method of instruction that incorporates basic elements of cognitive learning theory. Colleges of pharmacy use PBL to aid anticipated learning outcomes and practice competencies for pharmacy student. The purpose of this study were to implement and evaluate a model of small group PBL for 5th year pharmacy students in the clinical environment that facilitated by pharmacy instructors. A PBL model was implemented in 1-day periods each week in total of 15 weeks at clinical practice sites. PBL activities consisted of providing pharmaceutical care service, collecting patients based clinical data, evaluation therapeutic regimens, developing SOAP note, peer feedback and case wrap-up sessions. In data collection, 36 students who had participated model completed a 17-items questionnaire using 5-point Likert scale (Cronbach's Alpha is 0.96) about their pharmacy student competencies at before and after finished course. They also completed 11-items questionnaire using 5-point Likert scale (Cronbach's Alpha is 0.87) about their satisfaction. Data of pharmacy student competencies and satisfaction were analyzed by paired sample t-test and descriptive statistics in respectively.

From the result of this study indicated that pharmacy student's competencies have been increased through PBL course and also statistical significant ($P < 0.05$) have found in every items mainly in clinical skills regarding apply didactic knowledge to direct patients care activities such as identifying, prioritization, solving therapy-drug related problem as well as clinical communication with patients or other members of interdisciplinary team. Moreover, in the part of satisfaction found that all of questions were scored range from high to highest level of mean score and most of modes were 4. Overall concluded that the PBL model enhances pharmacy student competencies and students were satisfied with PBL course.

Keywords: Pharmacy education; problem-based learning; clinical environment.

Introduction

Problem-based Learning (PBL) is an alternate method of instruction that incorporates basic elements of cognitive learning theory. The innovative instruction strategy of PBL is student-centered approach that empowers self directed learning through problem solving skill development in real world practice situations (Savery, 2006).

PBL has been increasingly and wildly used in pharmacy education since year 2000 which the standards for curriculum of ACPE (The Accreditation Council for Pharmacy Education) has been published and indicated that "the educational process should promote lifelong learning through the emphasis on active, self-directed learning and the curricula should include teaching strategies to ensure the adeptness of critical thinking and problem-solving" (American Council on Pharmaceutical Education, 2000, pp. 52-53). Moreover, The ACCP (American College of Clinical Pharmacy) also suggests that pharmacy educators need to place more emphasis on preparing students for problem solving, critical thinking, ethics, communication and self-directed learning. Because of expanding the scope of pharmacy practice, Pharmacists will be involved in expanded patient care responsibilities. The pharmacists' role in today's health care system requires greater problem-solving capabilities, effective thinking abilities, sound decision making skills, and effective communication skills (ACCP, 2000, pp. 991-1020).

To comply with these suggestions, many schools and colleges of pharmacy use PBL to aid anticipated learning outcomes and practice competencies for their pharmacy students. Students are acquired and applied knowledge while developing problem-solving, critical-thinking, and decision-making skills (Culbertson, Kale, & Jarvi, 1997, pp. 18-25).

PBL has been used in pharmaceutical education courses, and numerous published reports describe the resulting experiences with this educational method. (Culbertson, Kale & Jarvi, 1997, pp. 19–26) Several studies showed that positive impacts of PBL on the learning behavior, knowledge, skill and attitude of students. (Hamoudi, Nagavi, & Al-Azzawi, 2010, pp. 206–219) The results of the current meta-analysis indicate that the PBL curriculum seems to improve the academic performance of pharmacy students when compared to the traditional method of instruction (Galvao, Silva, Neiva, Ribeiro & Pereira, 2014, pp. 1-7).

The purpose of this study were to implement and evaluate a model of small group PBL that incorporate to the course of the special problems in pharmacy for 5th year pharmacy students in the clinical environment that facilitated by pharmacy instructor.

Literature Review

Overview: definition, characteristics, effectiveness of PBL

Problem-based learning (PBL) represents a major development and change in educational practice that continues to have a large impact across subjects and multiple disciplines worldwide. PBL has been used successfully for over 30 years and endorsed by a wide variety of national and international organizations such as the medical education/medical colleges (Muller, 1984), (Walton & Matthews, 1989: pp. 542-558.) the World Health Organization (WHO, 1993) the nurse education (English National Board, 1994) as well as the pharmacy education/pharmacy colleges (Ross, Crabtree, Theilman, Ross, Cleary, & Byrd, 2007).

In the literature, PBL has been defined and described in many ways. PBL is used to refer to many contextualized approaches to instruction sharing that much of the learning and teaching is anchored in concrete problems (Evenson & Hmelo, 2000). This focus on concrete problems initiating the learning process is central in most definitions of PBL. Barrows, a pioneer of PBL,

define the concept of PBL as "the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered first in the learning process and serves as a focus or stimulus for the application of problem solving or reasoning skills, as well as for the search for or study of information or knowledge needed to understand the mechanisms responsible for the problem and how it might be resolved" (Barrows, 1986, pp. 481-486).

A much-quoted definition is the one given by Albanese and Mitchell (Albanese & Mitchell, 1993, pp. 52-81): "PBL at its most fundamental level is an instructional method characterized by the use of patient problems as a context for students to learn problem-solving skills and acquire knowledge about the basic and clinical sciences". Vernon en Blake (Vernon& Blake, 1993, pp. 550-563) define PBL by its instructional design components, students' cognitive processes and teacher's role: "a method of learning (or teaching) that emphasizes (1) the study of clinical cases, either real or hypothetical, (2) small discussion groups, (3) collaborative independent study, (4) hypothetico-deductive reasoning, and (5) a style of faculty direction that concentrates on group progress rather than imparting information."

In general, PBL is an instructional (and curricular) learner-centered approach that empowers learners to integrate theory and practice, apply knowledge and skills to develop a viable solution to a defined problem (Savery, 2006, pp. 9-20).

Six essential elements of PBL consisted of (Barrows, 1996, pp. 3-13):

(1) student-centered, (2) small student groups-environment, (3) tutor as a facilitator or guide, (4) authentic problems are primarily encountered in the learning sequence, before any preparation or study has occurred, (5) the problems encountered are used as a tool to knowledge acquisition and the problem-solving skills necessary to eventually solve the problem, and (6) new information needs to be acquired through self-directed learning.

Positive effects of PBL on student learning has been shown in several previous studies that associated with optimal learning performance, particularly in the area of knowledge retention; integration of basic science knowledge to the solutions of clinical problems; self-directed learning skills, and increased intrinsic interest in subject matter (Major & Palmer, 2001, pp. 4-9). Similar with one of studies in an East Asian context where is known for its reliance on traditional approaches to teaching and learning, the statistical analyses suggest that PBL can exert a positive impact on instructional effectiveness especially in 3 dimensions of student competency including action-directed learning, student engagement, assessment and feedback (Hallinger & Lu, 2011, pp. 267-285). Corresponding with the existing evidence of using PBL in pharmacy curriculum that it's seems to improve the academic performance of pharmacy students when compared to the traditional method of instruction (Galvao, Silva, Neiva, Ribeiro, & Pereira, 2014).

Design of Small-Group Problem-Based Learning model in the course of Special Problem in Pharmacy Practice

Course description

This is the professional elective course in 3 credit hours offered to 5th year pharmacy students. The course is designed to allow students to apply didactic knowledge to direct patient care activities and practice theirs pharmacy knowledge in practice sites. Students will apply their knowledge of pathophysiology, pharmacology, pharmacokinetics and pharmacotherapy to optimize patient care in a variety of specialty settings. Students will concentrate on patient specific pharmacotherapy, evidence based medicine, medication use evaluation and effective communication with patients and healthcare professionals.

Course Objectives

Upon completion of this course, students will be able to:

- Review patient profile and clinical data gathering from patients and patients medical record such as OPD card, IPD chart
- Design an appropriate treatment plan and evidence-based therapeutics regimens for individualized patients
    - Specify therapeutic goals for individualized patients incorporating the principles of evidence-based medicine that integrate patient-specific data, disease and medication-specific information, ethics, and quality of life considerations
    - Design a patient-centered regimen that meets the evidence-based therapeutic goals established for a patient; integrates patient-specific information, disease and drug information, ethical issues and quality of life issues; and considers pharmacoeconomic principles
- Design a patient-centered, evidenced-based monitoring plans
    - Specify efficacy monitoring parameters for a therapeutic regimen that effectively evaluates achievement of the patient-specific goals
    - Specify toxicity monitoring parameters for a therapeutic regimen that adverse effects may be occurred
- Recommend or communicate evidence-based therapeutic regimen and corresponding appropriated monitoring plan to other members of the interdisciplinary team and patients in a way that is systematic, logical, accurate, timely, and secures consensus from the team and patient.
- Practice communication skill through providing counseling to patients and caregivers, including information on medication therapy, adverse effects, compliance, appropriate use, handling, and medication administration
- Refer patients to an appropriate health care provider when they have health care needs that cannot be met by the pharmacist based on the patient's acuity and the presenting problem
- Devise a plan for follow-up for a referred patient.

Educational Environment

A PBL model was implemented in 1-day periods each week in total of 15 weeks for elective course of special problem in pharmacy practice in order to maintain compliance with the accreditation standard.

Strategies to promote student learning outcome consisted of lecture based teaching and problem based learning in clinical practice sites with a teacher who was a facilitator when they were practice.

In lecture based teaching, clinical topic consisted of how to data gathering; tip and trick for SOAP, introduction to medication use process and medication evaluation in oncology, psychiatric and community pharmacy.

In clinical practice sites rotations, students would have the opportunity to provide clinical pharmacy services by randomly assigned 3 practice sites per student. Clinical practice sites including acute care in internal medicine ward, oncology ward, psychiatric ward and community pharmacy care in community pharmacy. Turning rotation to other clinical practice sites has been performed every 3 weeks then student have a case presentation with teacher at the faculty.

The following is a list of activities that are representative of pharmacy student's responsibilities during the rotation including internal medicine ward and community pharmacy.

In internal medicine ward:

- Pharmacists ward rounds with preceptor and teacher
- Providing pharmaceutical care based on patients' needs by identifying and resolving problems in individualized patients
    - Review patient profile and clinical data gathering from patients and patients medical record such as OPD card, IPD chart
    - Review of laboratory data to monitor for appropriate dosing of drug therapy
    - Evaluation of all medication regimens for appropriateness and cost-effectiveness
    - Identification of and resolution of any drug related problems
    - Proactive involvement in selecting, modifying and monitoring drug therapy
    - Provision of medication information to interdisciplinary team such as physicians, nurses, and patients
    - Monitor for and report Adverse Drug Reactions
- Record and report pharmacist SOAP note for individualized patients
- Discussions with the preceptor and teacher about drug related problems and its solutions.

In community pharmacy:

- Providing pharmaceutical care based on patients' needs by identifying and resolving problems in individualized patients
    - Clinical data gathering from patients
    - Differential diagnosis based on patient's presenting signs and symptoms
    - Design medication regimens for appropriateness and cost-effectiveness
    - Providing medication information about efficacy monitoring parameter and toxicity monitoring parameter to patients
    - Advocating lifestyle changes that can improve the outcomes of medicinal therapy
    - Monitor for and report Adverse Drug Reactions
- Record and report pharmacist SOAP note for individualized patients
- Discussions with the preceptor and teacher about drug related problems and its solutions.

Method

This research was quasi-experimental study and one group pretest-posttest design aims to study effects of a model of small-group problem-based learning in elective course of special problem in pharmacy practice for 5th year pharmacy students.

A PBL model was implemented in 1-day periods each week in total of 15 weeks for elective course of special problem in pharmacy. Strategies to promote student learning outcome consisted of lecture based teaching and problem based learning in clinical practice sites with a teacher who was a facilitator when they were practice. In clinical practice sites rotations, students would have the opportunity to provide clinical pharmacy services by randomly assigned 3 practice sites per student. Students would be rotated in clinical practice sites every 3 weeks after that student have a case presentation with teacher at the faculty.

Outcome has been evaluated at before and after PBL model implementation in 2 domains including pharmacy student's competencies and satisfaction.

Sample size was 36 students who registered in elective course of special problem in pharmacy practice. Students were divided into 7 groups, consisted of 5 students per group.

In data collection, 36 students who had participated in the model completed a 17-items self-assessment questionnaire using 5-point Likert scale (Cronbach's Alpha is 0.96) about their pharmacy student competencies. In addition, they also completed 11-items questionnaire using 5-point Likert scale (Cronbach's Alpha is 0.87) about their satisfaction.

The inferential statistics (Pair t-test) was used to compare mean score between before and after finished course in the part of student's competencies. Descriptive statistic such as mean score was used to describe student's satisfaction in various aspects. Rating scales would be scaled to have equal intervals.

Table 1. Interpretation of mean score

Rang of mean score	Meaning
4.21 - 5.00	Hightest
3.41 - 4.20	High
2.61 - 3.40	Medium
1.81 - 2.60	Low
1.00 - 1.80	Lowest

Results

Table 2 was shown demographic data of sample size which consisted of 36 students who registered in elective course of special problem in pharmacy practice. There were 8 male (22.2%) and 28 female (77.8%). Mean age and Grade Point Average (GPA) of them were 22.58±1.02 and 3.18±0.48 in respectively.

Table 2. Demographic data of respondents

Characteristics	Students
Sex	
Male	8 (22.2%)
Female	28 (77.8%)
Age (years)	
Mean ± SD	22.58±1.02
Grade Point Average	
Mean ± SD	3.18±0.48

Table 2 was shown pharmacy student's competency at before and after 15 weeks of PBL model implementation.

Table 3. Self assessment rating score in pharmacy student's competency

Items	Before		After		Mean Differences	P value
	Mean	SD	Mean	SD		
1. Provide pharmaceutical care according to Good Pharmacy Practice concept.	2.44	0.88	3.50	0.77	1.06	< 0.05
2. Review patient profile and clinical data gathering from patients and patient's medical record such as OPD card, IPD chart.	2.22	0.64	3.42	0.69	1.20	< 0.05

Items	Before		After		Mean Differences	P value
	Mean	SD	Mean	SD		
3. Recommend individualized lifestyle modifications that can improve the outcomes of medicinal therapy.	2.22	0.48	3.47	0.56	1.25	< 0.05
4. Identify and refer patients who met referral criteria to an appropriate health care provider.	2.31	0.75	3.58	0.55	1.27	< 0.05
5. Design an appropriate pharmacologic regimens and non- pharmacologic treatment regimens for individualized patients.	2.31	0.89	3.69	0.52	1.38	< 0.05
6. Apply didactic knowledge including diseases and pharmacotherapy to direct patient care activities.	2.39	0.77	3.64	0.64	1.25	< 0.05
7. Initial assessment of disease severity in individualized patients.	2.31	0.75	3.69	0.58	1.38	< 0.05
8. Evaluation of all medication regimens in 4 domains including appropriate indication, efficacy, safety and cost in individualized patients.	2.31	0.75	3.72	0.61	1.41	< 0.05
9. Interpret and analyze medical patient's medical information for develop pharmaceutical care plan.	2.36	0.80	3.67	0.79	1.31	< 0.05
10. Identify risk factors and the underlying causes in the development of patient's diseases.	2.47	0.81	3.64	0.80	1.17	< 0.05
11. Identify patient's medical problem list.	2.28	0.85	3.44	0.61	1.16	< 0.05
12. Prioritize patient's problem list based on urgency and severity of diseases.	2.33	0.89	3.61	0.77	1.28	< 0.05
13. Identify patient's drug related problem.	2.25	0.87	3.36	0.68	1.11	< 0.05
14. Solve patient's drug related problem in individualized patients.	2.28	0.85	3.42	0.81	1.14	< 0.05
15. Communicate appropriated evidence-based therapeutic regimen through pharmacist note on medical record to other members of the interdisciplinary team such as physician and nurse.	2.14	0.83	3.50	0.77	1.36	< 0.05
16. Encourage patient's medication compliance.	2.31	0.82	3.42	0.65	1.11	< 0.05
17. Design a patient-centered, evidenced-based monitoring plan including efficacy monitoring parameters and toxicity monitoring parameters.	2.39	0.80	3.53	0.65	1.14	< 0.05

From table 3 shown that student's competencies have been increased through PBL model in all items evaluation and also statistical significant ($P < 0.05$) have found in every items including providing of pharmaceutical care according to Good Pharmacy Practice concept, recommend individualized lifestyle modifications, clinical data gathering from patients and patient's medical record, identify patients who met referral criteria to an appropriate health care provider, designing an appropriate pharmacologic regimens and non-pharmacologic treatment regimens, application

of didactic knowledge to direct patient care activities, initial assessment of disease severity, evaluation of all medication regimens, interpretation and analyze medical patient's medical information for develop pharmaceutical care plan, identify risk factors for diseases progression, identify patient's medical problem list, prioritization of patient's problem list based on urgency and severity of diseases, identify patient's drug related problem, solve patient's drug related problem in individualized patients, communicate appropriated evidence-based therapeutic regimen through pharmacist note, encourage patient's medication compliance, designing a patient-centered, evidenced-based monitoring plan for individualized patients.

Table 4 showed student's satisfaction on various aspects after 15 weeks of PBL model implementation.

Table 4. Student's satisfaction

Issues	Mean	SD	Mode
1. Satisfied with the role of teacher who works as their facilitators.	4.22	0.54	4
2. Satisfied with student's role that must be self direct learning.	3.64	0.68	3
3. Satisfied with student's activities in PBL model.	4.00	0.79	4
4. Satisfied with an interesting PBL case which teacher selected.	4.03	0.70	4
5. Satisfied with PBL case which led to knowledge application in vertical and horizontal.	3.94	0.71	4
6. Satisfied with time course.	3.53	0.70	4
7. Satisfied with chance to independently pharmaceutical practice.	3.89	0.82	4
8. Satisfied with practice site.	3.67	0.83	3
9. Satisfied with the evaluation of this course.	3.75	0.84	4
10. Satisfied with overall quality of teaching and learning.	4.08	0.60	4

From table 4 shown thatthe most of students were satisfied with PBL model in various aspects. All of questions were scored range from high to highest level of mean score (3.41 - 5.00) and most of modes were 4.Students satisfied with the role of teacher who works as their facilitators in highest level of mean score followed by high level of mean score including satisfied with overall quality of teaching and learning, an interesting PBL case which teacher selected, activities in PBL model, chance to independently pharmaceutical practice and the evaluation of this course in respectively. However, there were 2 issues that modes were 3 including satisfaction with student's role that must be self direct learning and appropriate of practice site.

Discussion

Pharmacy educators will play a significant role in developing the knowledge, skills, and abilities needed to practice pharmaceutical care. Curriculum modifications and various instructional strategies will have to be considered to facilitate the learning outcomes of pharmacy students needed to practice pharmaceutical care. One such instructional strategy and/or curriculum model is Problem-based Learning (PBL) (Fisher, 1994, pp. 183-189).

The purpose of this study were to implement and evaluate a model of small group PBL that incorporate to the course of the special problems in pharmacy for 5th year pharmacy students in the clinical environment that facilitated by pharmacy instructor.PBL is an important part of the curriculum that integrates content and prepares students to provide patient-centered care, as indicated in the Blueprint for Pharmacy, and addressed by WHO patient safety curriculum guide. Moreover, PBL in the clinical environment give students the opportunity to apply their knowledge and skills with problem and case based in real world practice. Learning environment is one in which the students feel they are freely able to express their thoughts and ideas (WHO, 2011; Blueprint for Pharmacy, 2008).

The small group instructional method has multiple benefits. Active small group discussion encourages application, analysis, synthesis, and evaluation of facts and concepts. This process is essential for developing competence in clinical reasoning and critical thinking. Working in small groups allows students to take an active role in their own education. Students learn facts and concepts best when they use them to solve problems. Small group teaching with mixed levels of learners also offers the opportunity to set expectations of learners at all levels and demonstrate expectations for progressive competence in the continuum of medical education (Dennick, Exley, 1998, pp. 111-115).

PBL small group sessions in clinical environment can also complement the information presented in lectures by allowing students time to ask questions in a non-threatening environment and to think critically. This allows the students to detect and correct errors (their own, and sometimes those of the facilitator) and also offers students opportunities to problem solve, make clinical decisions, and practice clinical skills, especially communication skills. These are also useful in promoting student reflection, independence, and life-long learning (White & Manfred, 2010).

As pharmacy practice incorporates a greater patient care component, pharmacists will be held responsible for identifying and solving higher order clinical problems or encounter patient care problems that will require critical thinking skills and precise decision making abilities. Pharmacists will be involved in the clinical treatment of patients (pharmaceutical care) that requires more detailed communication with patients and health care providers. This expanded professional interaction will require pharmacists to utilize effective problem solving skills.

From this study indicated that pharmacy student's competencies have been increased through PBL course mainly in clinical skills regarding apply didactic knowledge to direct patients care activities such as identifying, prioritization, solving therapy-drug related problem as well as clinical communication with patients or other members of interdisciplinary team. Consistent with the study of the potential for problem-based learning in pharmacy education, found that practice competencies of pharmacy students can be increased via PBL course.(Fisher, 1994) As same as the result from meta-analysis of problem-based learning in pharmaceutical education which found that pharmacy student’s knowledge was improved by the PBL method. PBL students performed better on midterm examinations (odds ratio [OR]=1.46;95%CI : 1.16,1.89) and final examinations (OR =1.60; 95%CI:1.06,2.43) compared with students in the traditional learning groups. However, no difference was found between the groups in the subjective evaluations. (Galvao, Silva, Neiva, Ribeiro, & Pereira, 2014).

Moreover, the recent of meta-analyses comparing PBL to conventional classrooms indicated that PBL was superior when it comes to long-term retention, skill development and satisfaction of students and teachers, while traditional approaches were more effective for short-term retention as measured by standardized board exams.(Strobel & van Barneveld, 2009, pp. 44-58) In pharmacy and medical education of Thailand context, the one group pretest-posttest design which study on PBL effectiveness found that PBL method can also increase student's competencies,

practical skills, self direct learning skill as well as lifelong learning skills. (Chuangchum, Pholchan, Nopkesorn, & Pannarunothai, 2011, pp. 34-40).

Another advantage of this PBL model is that teacher works as facilitators of discussion rather than an instructor. The facilitator's primary function is to allowing students to struggle with a problem, providing guidance, reinforcing what is right, correcting errors and give individualized feedback on student's performance (White, & Manfred, 2010). Students who are challenged by the teacher who works as facilitators are likely to progress their learning more rapidly (WHO, 2011).

In the part of satisfaction, althoughthe most of students were satisfied with PBL model in high to highest level of mean score (3.41 - 5.00) and most of modes were 4. But there were 2 issues that modes were 3 including satisfaction with their role that must be self direct learning and appropriate of practice site. From this result consistent with the study of Chuangchum, found that some students (35%) of the class were satisfied with traditional passive learning more than self direct learning in PBL method (Chuangchum, Pholchan, Nopkesorn, & Pannarunothai, 2011, pp. 34-40). Moreover, peer feedback process between teacher and students may be limited by limitation of area space in clinical practice sites.

Conclusion

From the result shown that pharmacy student's competencies have been increased through PBL model in all items evaluation and also statistical significant ($P < 0.05$) have found in every items including providing of pharmaceutical care according to Good Pharmacy Practice concept, recommend individualized lifestyle modifications, clinical data gathering from patients and patient's medical record, identify patients who met referral criteria to an appropriate health care provider, designing an appropriate pharmacologic regimens and non-pharmacologic treatment regimens, application of didactic knowledge to direct patient care activities, initial assessment of disease severity, evaluation of all medication regimens, interpretation and analyze medical patient's medical information for develop pharmaceutical care plan, identify risk factors for diseases progression, identify patient's medical problem list, prioritization of patient's problem list based on urgency and severity of diseases, identify patient's drug related problem, solve patient's drug related problem in individualized patients, communicate appropriated evidence-based therapeutic regimen through pharmacist note, encourage patient's medication compliance, designing a patient-centered, evidenced-based monitoring plan for individualized patients.

The most of students were satisfied with PBL model in various aspects. All of questions were scored range from high to highest level of mean score (3.41 - 5.00) and most of modes were 4. Students satisfied with the role of the teacher who works as their facilitators in highest level of mean score followed by high level of mean score including satisfied with overall quality of teaching and learning, an interesting PBL case which teacher selected, activities in PBL model, chance to independently pharmaceutical practice and the evaluation of this course in respectively.

The implications of integrate problem-based learning in pharmacy education have 2 aspects such as students and pharmacy educator who works as facilitators. It was implied that the implementation of PBL can enhanced the pharmacy students' competencies and that generally the students were satisfied with the PBL course. These positive outcomes occurred when the teacher works as a facilitator of discussion in clinical environment.

However, interpretation and generalization of the result should be done with the concern of some limitations. First, main data in this studywas "Subjective data" from student's self assessment rating scale which difficult to verify. However, the questionaire has passed reliability test already before used. Second, outcome assessment of this study has based on perceived skill or perceived

knowledge not based on actual knowledge which measure by score on examination. Third, this study was one group pretest-posttest design which have not had control group (such as traditional teaching group) for true comparison.

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