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Problem-Based Learning Approach for the On-line Public Health Courses

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Abstract

In order to develop an online problem-based learning (PBL) method which will fit best into the International Cyber University for Health (ICUH) programs and meet all the learning needs of students in the field of public health, we have first considered the characteristics and nature of each course. Therefore, a modified PBL discussion method was adopted to attain the maximum efficiency for students to learn better from the subjects in the course contents. Although it is still in its initiation stage, the evaluations showed a successful implementation of PBL method with high satisfaction of students. In this article, we will examine the general PBL method, suggest our modification of PBL method for the courses, and finally analyze student's evaluation on PBL method.

Keywords:

problem-based learning (PBL), online education, cyber, discussion approach, public health

Introduction

At the entrance of the 21st century, cyber education offers an environment that enables instruction and learning to become independent of time and space. It opens up learning opportunities to people with physical or other limitations, thus unable to participate in conventional classroom education. The excitement and chance to learn are not limited to a single country, region or group, but extends to global community.

The conventional long distance courses are usually based upon the mere presentation of the didactic materials with an interaction, which is usually limited to question and answer type quizzes. Web conferences and net meetings are not integrated in a comprehensive model of teaching and learning [1]. It was as assumed that one of the main obstacles to meaningful learning is the discipline oriented approach to most of the educational curricula and courses. This is the fundamental reason why many authors claim that problem based learning (PBL) is the most useful way for engaging the students in a learning process based upon realistic situations whereby knowledge from different disciplines are integrated [2].

As a part of the project named, "Development of PBL (Problem-Based Learning) & CDL (Competency-Directed Learning) E-Learning Module for Asia-Pacific Area's Health Professionals," the International Cyber University for Health (ICUH) is currently introducing the public health oriented PBL discussion method into its on-line courses.

The goal of PBL is to motivate students to develop self-learning skills in a small group [3]. The PBL environment is student-centered, students-directed, fosters intrinsic motivation, promotes active learning, encourages peer teaching, involves timely feedback, and inculcate student self- and peer assessment [4]. The students are encouraged to use self-directed learning skills to analyze a given scenario to identify the problem, formulate key-learning objectives and collect whatever additional information required to address those objective [5].

PBL differs from traditional lecture-based curriculums in that it relies on the use of real or simulated problems to develop critical thinking skills. PBL provides a stimulus and a framework for applying problem solving skills, as well as the opportunity to acquire the information needed to understand the mechanisms and solution behind the problem [6].

In order to encourage the student to develop an appreciation for the interrelated nature of the physical, biological, and behavioral mechanisms that must be considered with each health problem, we plan to introduce PBL approach to web-based classes for ICUH.

The purpose of this study was to develop and evaluate the PBL method for graduate students in public health in order to assess the feasibility of an online approach as a PBL modality. In order to develop an online PBL method which will fit best into the ICUH programs and meet all the needs of students in the field of public health, we have first considered the characteristics and nature of each course. Subsequently, a modified PBL discussion method was adopted and implemented to draw the maximum efficiency for students to learn better from the subjects in the course contents. In addition, we also analyzed the student's evaluation on the PBL method employed.

Materials and methods

We introduced PBL discussion learning method to our three courses 2006 Fall semester of the ICUH: Introduction to Health Informatics, Comparative Health Law Seminar, Leadership in Crisis and Communication in Disasters & Health Care.

The students of each course were clustered into small groups of 8-10 students. Through the creation of an online environment, students working in small groups accessed information resources that had been prepared for them in advance. The communications are based on web conferencing, access to web pages, personal contacts, and group meetings.

PBL discussion process

We modified a PBL discussion process to maximize the teaching and learning efficiency for both professors and students. We have considered two factors: (1) characteristics and nature of public health courses and (2) web-based approach.

Three courses (Comparative Health Law Seminar, Leadership in Crisis Communication in Disasters & Health Care and Introduction to Health Informatics) have shown different characteristics and nature in education compared to other similar fields, such asmedicine and nursing. The public health courses often deal with health policy and administration which combines problem-solving with consensus-building and policy-making process. In addition, since this approach is introduced to cyber courses, the whole process should be carried out online, which may require some changes in communication, technology and methodology. After thorough consideration, we have developed the followingPBL process for the public health courses to magnify the learning efficiency for students who participate in online discussions

Table 1 - The modified PBL processof public health

PBL Process	Description
Pre-Discussion Activities – Blackboard Function	
Case (Scenario) Presentation	A case or scenario is posted on the blackboard of online classroom one week prior to the PBL discussion session. The related questions for self-study are also presented.
Private Student Research	Students read the case and begin to find resource materials and other references related to the case.
Intra-Discussion Activities (3~4 groups) – Meeting Room Function	
Case Recitation	A Tutor recites the case to be discussed and confirm if students understand the case correctly.
Fact Finding	A tutor leads students to source the facts, which may become debatable or significant in discussion.
Student Presentation	Each student makes a presentation on the answers for the questions and go on to the crossover discussions amongst the group.
Possible Solution Finding	Students argue and discuss on possible solutions for the posted case study
Consensus Building	Voting process will be carried out to build consensus among students on important matters. (Voting Function)
Decision Making	Students can develop a policy through decision-making process after consensus building.
Post-Discussion Activities – Board Function	
Class Discussion	Using the board function in the online classroom, the discussion results from each discussion group are presented and further discussed among all the students in the class.
Report & Evaluation	Each student submit a separate report as well as an evaluation for each PBL session (Report Function)

Evaluation of the effectiveness of PBL approach

After each PBL session, students evaluated the PBL discussion class for the feedback. We developed a simple 15-question evaluation form with 5-point scale which requires students to write both advantages and disadvantages of online PBL discussion approach. The questionnaire consisted of five sections, learning process, cases & problems, tutor's role, student's role, and learning effectiveness.

We analyzed the relationship among learning process, cases & problem, tutor's role, student's role for the learning effectiveness (Figure 1). This study compared the relative effects of each variable for learning effectiveness in the multivariate model.

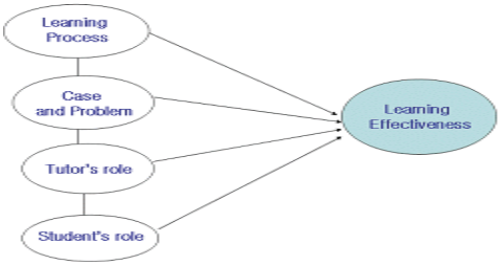

Figure 1 – Framework of the analysis

Kruskal-Wallis test was carried out to examine the statistical significance on the scores among three courses [8]. The

scores of each student were measured by two factors (Agree/ Disagree), and Chi-Square test was used to analyze the association between each factor and learning effectiveness. In addition, Multiple regression analysis was used to analyze the relationship between a single dependent variable and several independent variables.

Results

Students evaluation on online PBL discussion session

The results showed comparatively high scores in most parts. The students enjoyed much freedom to participate in discussions since they were not afraid of making mistakes online compared to traditional classroom environment. Some students pointed out the technical or systematic difficulties in the usage of meeting room function since computer or web access was running as smoothly. The Kruskal-Wallis test showed that the difference in the scores among three courses was statistically significant in learning process (chi-square value = 10.14, p-value = 0.006) and case and problem (chi-square value = 6.73, p-value= 0.034). The detailed results are shown in Table 3.

Association between learning effectiveness and factors type

The changes in learning effectiveness were measured according to the response factors (Agree/Disagree) of each variable. The results show that most variables in learning process, case & problem, tutor's role and student's role except for two variables, Organization of PBL Discussion and Appropriateness of PBL Questions were statistically significant, suggesting the high association between learning effectiveness and factors type as shown in Table 2.

The effect of learning process, case, tutor's and student's role factors on learning effectiveness

The effects of the independent variables to learning effectiveness were tested. Table 4 summarizes the coefficients, t-value, adjusted R2, and significance level of the regression model. In the regression model, the overall model was significant ($F=6.22$, $p<0.001$) and 76 percent of the variance of LDL cholesterol level is explained by independent variables ($R2=0.7567$). The learning process factor had significant influence on learning effectiveness in two variables, organization of PBL discussion and easiness of opinion presentation. The case factor also had significant influence on learning effectiveness in one variable, relevance of PBL case. In addition, the result shows that the case factor was significantly related to learning effectiveness (beta= 0.55622, t-value= 3.21, $p<0.0038$).

Discussion and conclusion

Although it is still in the initiation stage, the evaluations portrayed a successful implementation of PBL method with high satisfaction response from the students. The PBL approach enables students to understand the relevance of underlying knowledge and principles in health care practice [9].

For the PBL process, the web is used as a repository of multimedia documents that can be accessed by the students of the virtual classroom, a source of valuable structured information, and a synchronous communication channel with the capability of recording and marking the sequence of interventions. The use of web-based method appears to be a potentially feasible problem-based learning modality for the graduate public health course. Web-based PBL approach provides a unique opportunity for students worldwide to experience health education challenges that originate in a variety of distinctly different culture. Without any distance constraint, students can collaborate in a common work setting as they pursue solutions to health problems.

Another common setback is staffing time. Efficient PBL learning environment is highly dependent on the function and the participant group. This requires a tutor cum moderator to be well-versed in facilitating the PBL discussion environment, more than simply to be a subject matter expert. Feedbacks provided by students will be used to produce an enhanced PBL approach that will be evaluated further to determine its educational potential as compared to the traditionally assigned reality-based education. The student evaluations provide rich material to be reflected upon in terms of instructional and learning strategy for PBL. The results of the study will be also used to make future design and technology modications to the tutorials as part of an ongoing development process. In our PBL approach, students were given ill-structured problems through which they develop critical thinking and problem-solving skill. The obvious change to a more student-centered focus resulted in students reporting that they were more motivated to learn and that they maximized learning opportunities and became much more focused on their learning needs and responsibilities in the learning process.

Table 2 - Association between Learning Effectiveness and Factors Type

			Learning Effectiveness			
			Agree	**Disagree**	**Chi-Square Value**	**p-Value**
Learning Process	Organization of PBL Discussion	Agree	17(62.96%)	10(37.04%)	0.23	0.630
		Disagree	6(54.55%)	5(45.45%)		
	Easiness of Opinion Presentation	Agree	14(82.35%)	3(17.56%)	6.13	0.013
		Disagree	9(42.86%)	12(57.14%)		
	Helpfulness of Student Presentations	Agree	16(76.18%)	5(23.81%)	4.82	0.028
		Disagree	7(41.18%)	10(58.82%)		
Case & Problem	Relevance of PBL Case	Agree	15(93.75%)	1(6.25%)	13.75	<0.001
		Disagree	7(33.33%)	14(66.67%)		
	Hardness of Resource Search	Agree	23(71.88%)	9(23.13%)	10.92	<0.001
		Disagree	0(0.00%)	6(100.00%)		
	Appropriateness of PBL Questions	Agree	15(65.22%)	8(34.78%)	0.53	0.463
		Disagree	8(53.33%)	7(46.46%)		
Tutor's Role	Inducement of Student Participation	Agree	17(77.27%)	5(22.73%)	6.13	0.013
		Disagree	6(37.50%)	10(62.50%)		
	Positive Feedbacks	Agree	14(87.50%)	2(12.50%)	8.41	0.003
		Disagree	9(40.91%)	13(59.09%)		
	Appropriate Intervention	Agree	15(78.95%)	4(21.05%)	5.39	0.020
		Disagree	8(42.11%)	11(57.89%)		
Student's Role	Activeness of Participation	Agree	18(78.26%)	5(21.74%)	7.67	0.005
		Disagree	5(33.33%)	11(66.67%)		
	Sufficient Preparation	Agree	20(74.07%)	7(25.93%)	7.16	0.007
		Disagree	3(27.27%)	8(72.73%)		
	Understanding of Student Presentations	Agree	20(71.43%)	8(28.57%)	5.29	0.021
		Disagree	3(30.00%)	7(70.00%)		

Table 3 - Determinant of Learning Effectiveness by Multiple Regression Analysis

		Beta-Coefficient	**t-Value**	**p-Value**
Learning Process	Organization of PBL Discussion	-0.27092	-1.85	0.0767
	Easiness of Opinion Presentation	0.22872	1.78	0.0874
	Helpfulness of Student Presentations	0.09444	0.63	0.5331
Case and Problem	Relevance of PBL Case	0.55622	3.21	0.0038
	Hardness of Resource Search	0.06482	0.56	0.5808
	Appropriateness of PBL Questions	0.13569	0.99	0.3313
Tutor's Role	Inducement of Student Participation	0.0892	0.51	0.6116
	Positive Feedbacks	0.16278	1.16	0.2587
	Appropriate Intervention	-0.27616	-1.47	0.1556
Student's Role	Activeness of Participation	-0.18422	-1.13	0.268
	Sufficient Preparation	0.10595	0.72	0.4761
	Understanding of Student Presentations	0.36701	2.28	0.0318
Model Fitness	F statistic	6.22		
	P-value	<0.0001		
	R square	0.7567		

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