Problem-based Teaching to Promote Skills in Communication and Use of Information Technology by Students Majoring in Information Technology

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Abstract

This research aimed to develop skills in communication and use of information technology of students majoring in information technology who learned through problem-based teaching and to measuring learners' satisfaction levels with the learning set-up through problem-based teaching. Research results are as follows: 1) the evaluation of skills in communication and use of information technology through presentation work in front of the class showed that media design received the highest average score ($\bar{X}$ = 3.67), followed by communication ($\bar{X}$ = 3.31) and use of media ($\bar{X}$ = 3.12). As for the report summarizing project results, content received the highest average score ($\bar{X}$ = 3.52) followed by report format ($\bar{X}$ = 3.28) and use of language ($\bar{X}$ = 2.96). 2) Learners were most satisfied with the set-up of problem-based learning activities to promote skills in communication and use of technology via the teacher's use of a variety of technology media such as video clips, PowerPoint media, and examples of programs to complement the teaching ($\bar{X}$ = 3.63, SD = 0.56), followed by learners' freedom to do their own research in and outside class ($\bar{X}$ = 3.62, SD = 0.54) and learners' presentation using a variety of useful media ($\bar{X}$ = 3.60, SD = 0.54).

Keywords: skills in communication and use of information technology, problem-based teaching

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Introduction

Higher education institutes are part of the organizations which can force educational reform by adjusting the instructional roles in the twenty-first century. They can make the learning process flexible enough to promote and support life-long education, enhance and develop the new generation of their graduates to be equipped with knowledge and morality, and assist in creating nice and smart people. These graduates should be able to solve the problems and develop the quality of higher education for the participation into the ASEAN Community (Office of Higher Education Commission, B.E. 2554: 59). At present, information technology and communication has played such a great role in daily life that they have become the fifth necessity for living. In the period of communication, the development of technology and communication was so rapid that the learning resources were accessible. This has enabled knowledge to be used for problem solution. There are many channels to access learning resources. The learning resources expanded from spoken language into digital media, like video clips, documentaries, news, moving pictures and case studies. Moreover, there is also access to learning resources abroad. Students majoring in Information Technology, who directly deal with a variety of technology, need development of their proficiency in communicative skills and use of information technology, as mentioned in the fifth learning standard, namely mathematical analytical thinking, communicative skills, and information technology skills, of the Thai Qualifications Framework for Bachelors of Computer, B.E. 2552. Problem-based instruction, which provides the learners with the IT tools currently available, can enable the learners to access the learning resources for systematic problem solution. However, the learners need to be aware of accurate communication in their own language and in the target language. Moreover, the learners should also be stimulated to summarize the key concepts of the assigned tasks and present the information through various forms of information technology. In this way, the learners will be equipped with the skills to present information media with awareness of the appropriate principles of communication, as part of their preparation for joining the ASEAN Community.

Methodology

1. Population/Sample

The population comprised 54 second-year students, and the 46 and 74 third-year students, majoring in Information Technology, who studied *Computer Operation System, Introduction to Service Science and Laws and Ethics in Information Professionalism,* respectively, in the first semester of Academic year 2013.

2. Collection of Data

2.1 The data were collected in class from observations and inquiries while the learners gave presentations, and from evaluations with the evaluation form of communication skills and use of information technology.

2.2 The data were collected after class from the questionnaire designed to evaluate the learners' satisfaction with the problem-based instruction, promotion of communication skills and use of information technology.

3. Research Instruments

3.1 The lesson plan for problem-based instruction was used to promote the information technology students' skills in communication and use of information technology, as specified in Table 1.

Table 1 Lesson Plan for Problem-Based Instruction

Instructor's Role	Activities	Behavioral Objectives	Teaching Material/ Learning Resources
Instructor	1. Identifying the problem and analyzing the problem with some tools	The learners should be able to analyze the cause of the problem in the case study	- Articles/news/ worksheets/ instruments for root analysis such as mind maps and fish bone - Library/Internet access
Mentor/Advisor and Comprehensive-Knowledge Summary Generator	2. Dividing learners into groups 2.1 Arranging learners into smaller groups of three each and assigning the learners to study the real case study 2.2 Assigning each group of learners to discuss and analyze the issue assigned., analyzing the cause of problems and the way to solve the problems, and giving the presentation to the class	The learners should be able to find out the cause of the problem and propose the solution to the problem	- Articles/news/ computer and presentation programs - Library/Internet access
	Evaluation: • Presentation to the class • Questions and answers • Proposing solutions to other similar problems		

Table 1 Lesson Plan for Problem-Based Instruction (cont.)

Instructor's Role	Activities	Behavioral Objectives	Teaching Material/ Learning Resources
Counselor/ Advisor	3. Dividing learners into groups 3.1 Dividing learners into groups of 5-10 each. Defining the issue and area of the problem to be assigned to the learners. The learners should propose the topic for the project to solve the problem and predict the possible solution to the problem according to the knowledge gained. 3.2 The learners in each group should propose the topics they are interested in and develop an understanding of the topics in order to prepare for the project. 3.3 The instructor presents the basic knowledge about how to search for information from different learning resources. 3.4 The learners are assigned to search for information and manage the information to develop the solution to the selected problem. 3.5 The learners cooperate to summarize the comprehensive knowledge under each topic and rearrange it as their group knowledge, as literature reviews. Then they can use the knowledge to plan for the whole process of the project which is presented to the class for ideas exchange and suggestions from other groups.	1. The learners should be able to identify the information required for the project 2. The learners should be able to find out the information and analyze it, to help solve the problem in the assigned task.	• Computer and presentation programs • Technological media such as pictures, sounds, moving pictures in video clips • Tools used in the project, like mind maps, schedule plans, etc. • Library/Internet access/ field expert
	Evaluation: • Presentation to the class • Rearranging the data and information used in the project		
Supervisor/ Advisor	4. The learners conduct what has been planned; the instructor serves as the facilitator and mentor while working on the project	The learners can perform as planned in the project proposal	
	Evaluation: Participation with group members Performance as planned in the project proposal		

Table 1 Lesson Plan for Problem-Based Instruction (cont.)

Instructor's Role	Activities	Behavioral Objectives	Teaching Material/ Learning Resources
Evaluator/ Comprehensive-knowledge summary generator of the learners' project	5. The learners present their own project 5.1 The learners are assigned to make a summary report and prepare the media for the class presentation with mobile multimedia of 5-10 minutes, depending on the content specified in the worksheet. 5.2 The learners give a presentation with technological media in various forms, for knowledge exchange with their peers.	1. The learners can present the project with the combination of animated media. 2. The learners are aware of the importance of copyrights in using technological media	- Worksheet/ computer and presentation programs - Technological media such as pictures, sounds, moving pictures in video clips - Presentation-editing programs, like Movie maker, PixBuilder Studio and Brochure Builder
	Evaluation: Assessed with the project presentation to class to summarize the project		

3.2 The assessment form of skills in communication and use of information technology developed to assess the skills and usage was divided into 2 parts. In the former part, the presentation to class about the assessment of the skills and usage was divided into 5 aspects, with a score of 4 points for each, or 20 points as the total score. In the latter part, the summary report of the project to assess the skills in communication and use of information technology was divided into 5 aspects, with the score of 4 points for each, or 20 points as the total score.

3.3 The evaluation form for learner's satisfaction with problem-based instruction to promote skills in communication and use of information technology was designed with a 4-point rating scale and with open-ended questions at the end, The numerical values corresponded to the following qualifications (Srisa-ard, B.E. 2535: 100).

4 - most satisfied

3 - very satisfied

2 - not really satisfied

1 - least satisfied

Then the values of satisfaction were interpreted, according to following rubric.

The value of 3.50 – 4.00 means that the learner was most satisfied.

The value of 2.50 – 3.49 signifies that the learner was quite satisfied.

The value of 1.50 – 2.49 signifies that the learner was not really satisfied.

The value of 1.00 – 1.49 signifies that the learner was least satisfied.

4. Statistics Used in Data Analysis

The statistics used in the analysis of data were mean and standard deviation.

Results

1. Findings on the evaluation of skills in communication and use of information technology

The findings on the evaluation of skills in communication and information technology use of the three courses, with the criterion-referenced evaluation according to the rubric, could be divided into the two following parts.

1) Class Presentation for the Evaluation of Skills in Communication and IT Use of the 3 Courses, as described in Table 2

Table 2 Average Values of Class Presentation Scores for Evaluation of Skills in Communication and IT Use of 3 Courses

Courses List of Evaluated Issue	Computer Operation System	Introduction to Service Science	Laws and Ethics in Information Professionalism	Average Values of Scores	Interpretation
1. Media Design	3.64	3.50	3.88	3.67	Most satisfied
2. Communication	3.64	3.17	3.13	3.31	Very satisfied
3. Use of Media	3.27	2.33	3.75	3.12	Very satisfied
4. Language Use	2.64	2.67	3.50	2.94	Very satisfied
5. Ethics and Morality	2.00	2.17	3.00	2.39	Not really satisfied
Total	**15.18**	**14.50**	**17.25**	**3.09**	**Very satisfied**

According to Table 2, it was found that the result of the learners' satisfaction evaluation through the specified rubric of class presentation for the Computer Operation System Course was valued at 15.18 on average. In particular, the evaluation result of media design and communication was valued in the highest level, at 3.64. For the Introduction to Service Science Course, the evaluation result was 14.50 on average. Considering particular issues, the evaluation result of media design was valued in the highest level, at 3.50. For the Laws and Ethics in Information Professionalism Course, the evaluation result was 17.25 on average. In particular, the evaluation result of media design was valued in the highest level, at 3.88. For the overview of class presentation for all of the three courses, it was revealed that the evaluation result of media design was valued in the highest level ($\bar{\chi}$ = 3.67), followed by communication and use of media, at $\bar{\chi}$ = 3.31 and $\bar{\chi}$ = 3.12, respectively.

2) Summary Report of the Project for Overall Evaluation of Skills in Communication and Use of Information Technology in 3 Courses, as described in Table 3

Table 3 Means in Summary Report of Project for Overall Evaluation of Skills in Communication and Use of Information Technology in 3 Courses

Courses List of Evaluated Issue	Computer Operation System	Introduction to Service Science	Laws and Ethics in Information Professionalism	Means $\bar{\chi}$	Interpretation
1. Contents	3.36	3.33	3.88	3.52	Most satisfied
2. Language Use	2.82	3.17	2.88	2.96	Very satisfied
3. Ethics for Data Use	2.64	3.00	3.00	2.88	Very satisfied
4. Format of Report	3.00	3.33	3.50	3.28	Very satisfied
5. Morality and Ethics	2.82	3.00	3.00	2.94	Very satisfied
Total	**14.64**	**15.83**	**16.25**	**3.12**	**Very satisfied**

According to Table 3, it revealed the average result of the learners' satisfaction evaluation through the specified rubric in the project report for the Computer Operation System Course was valued at 14.64. In particular, the issue of contents got the highest score at 3.36. For the Introduction of Service Science Course, the average result was valued at 15.83. In particular, the issues of contents and report format got the highest average scores of 3.33. For the Law and Ethics in Information Professionalism, the average result was valued at 16.25. In particular, the issue of contents got the highest average score at 3.88. In terms of the overview of the summary report of the project, it revealed that the contents got the highest average score, at $\bar{\chi}$ = 3.52, followed by the report format and the language use at $\bar{\chi}$ = 3.28 and $\bar{\chi}$ = 2.96, respectively.

2. Findings on Learners' Satisfaction with Problem-Based Instruction to Promote Skills in Communication and Use of Information Technology (Provided in Table 3)

Table 4 Means and Standard Deviation of Learners' Satisfaction with Problem-Based Instruction to Promote Skills in Communication and Use of Information Technology in Particular and Overall Aspects

Items	Description	$\overline{\chi}$	SD	Levels of Satisfaction
1	The Instructor promoted learning from real sources such as through news or articles.	3.35	0.58	Very satisfied
2	The instructor stimulated learners to present the way to solve the problem through the use of an example case study.	3.41	0.58	Very satisfied
3	The learners agreed with the teaching method, which used real problems as examples, to stimulate themselves to find out the solution to the problem.	3.36	0.57	Very satisfied
4	The instructor suggested the way to search for information and various information sources from which the learners could search for knowledge.	3.49	0.59	Very satisfied
5	The instructor stimulated the learners to search for information from different sources.	3.54	0.59	Most satisfied
6	The instructor stimulated the learners to summarize the knowledge according to the issues they studied.	3.44	0.60	Very satisfied
7	The instructor stimulated the learners to be aware of ethics of how to use data and give reference to the data sources.	3.38	0.63	Very satisfied
8	The learners had freedom to search for knowledge by themselves, both inside and outside the classroom	3.62	0.54	Most satisfied
9	The instructor provided clear examples to illustrate principles before allowing the learners to do some assignments	3.37	0.65	Very satisfied
10	The instructor allowed the learners to choose some details of the project by themselves, such as the cooperative organization they would use for the project.	3.50	0.57	Most satisfied

Table 4 Means and Standard Deviation of Learners' Satisfaction with Problem-Based Instruction to Promote Skills in Communication and Use of Information Technology in Particular and Overall Aspects (cont.)

Items	Description	$\bar{\chi}$	SD	Levels of Satisfaction
11	The instructor explained the criteria for scoring and identified the objectives of the project beforehand	3.50	0.56	Most satisfied
12	The instructor was always there to give advice and help solve the problems of the group work.	3.27	0.66	Very satisfied
13	The instructor stimulated the learners to realize the significance of correct usage of grammar in the language.	3.45	0.59	Very satisfied
14	The instructor gave the learners some advice while they were working on the project, both inside and outside the classroom.	3.47	0.57	Very satisfied
15	The instructor used various technological media, like video clips and PowerPoint Program for instruction.	3.63	0.56	Most satisfied
16	The instructor provided access to communication via technology, like e-mail and Group, for learners	3.51	0.59	Most satisfied
17	The instructor provided the ability to exchange ideas among learners and between learners and the instructor, such as by using the Group of the course and uploading files onto the Internet.	3.55	0.56	Most satisfied
18	The instructor enabled the learners to combine the technological media with the class presentation such as the use of VTR	3.49	0.60	Very satisfied
19	The learners realized the significance of the correct uses of Thai and foreign languages, according to the grammatical rules.	3.36	0.63	Very satisfied
20	The learners gave a presentation with various kinds of media	3.60	0.54	Most satisfied
21	The learners could use the knowledge as the guidelines to solve relevant problems in the future.	3.47	0.54	Very satisfied
22	The learners were satisfied with arranged format of instruction.	3.49	0.57	Very satisfied
	Overall	**3.47**	**0.59**	**Very satisfied**

According to Table 4, the learners were satisfied with the problem-based instruction to promote skills in communication and use of information technology. As a whole, the learners were highly satisfied at the level of $\bar{X}$ = 3.47, *SD* = 0.59. In particular, the learners were found to be most satisfied with 3 items above. The most satisfying item was Item 15, which stated that the instructor used various technological media, like video clips and PowerPoint Program for instruction, at the level of $\bar{X}$ = 3.63, *SD* = 0.56. The next most satisfying item was Item 8, which stated that the learners had freedom to search for knowledge by themselves, both inside and outside the classroom, at the level of $\bar{X}$ = 3.62, *SD* = 0.54. The third most satisfying item was Item 20, which stated that the learners gave a presentation with various useful media, at the level of $\bar{X}$ = 3.60, *SD* = 0.54.

According the open-ended questions, the media which were used the most often were presentation programs, like PowerPoint Program, at the level of 95%, followed by the VDO editing program, at the level of 87%, the picture editing program, at the level of 75%, and other presentation programs, at the level of 20%.

Discussion

The research findings revealed that the problem-based instruction promoted skills in communication and use of information technology in class presentations and summary project reports. The problem-based instruction helped the learners solve the problem by allowing them to search for information from information sources by themselves, make their own decision on the knowledge they searched for, and cooperate with their classmates in groups; the instructor served only as a facilitator. The specification of scoring criteria for class presentations and summary project report stimulated the learners to be active in working on the assigned tasks. Moreover, the problem-based instruction provided the learners with some freedom to study, both inside and outside the classroom. The learners could also give presentations with various kinds of media. Meanwhile, the instructor's use of various media also made the learners satisfied with the problem-based instruction.

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