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# Problem Solving Steps in Online PBL

## -Research Framework

Nurhazirah bt Mohd Bakri<sup>1</sup>

Dr.Faaizah Shahbodin<sup>2</sup>

Dr.Hajah Norasiken bt Bakar<sup>3</sup>

Department of Interactive Media

Faculty of Information Technology and Communication

Universiti Teknikal Malaysia Melaka,

Melaka, Malaysia

[nurhazirahbakri@yahoo.com](mailto:nurhazirahbakri@yahoo.com)<sup>1</sup>

[faaizah@utem.edu.my](mailto:faaizah@utem.edu.my)<sup>2</sup>

[norasiken@utem.edu.my](mailto:norasiken@utem.edu.my)<sup>3</sup>

**Abstract**—Problem based learning is a well known learning method that will start the learning by giving the problem as the appetizer of the learning process. The existence of online problem based learning invites researchers to produce more creative learning system. This paper will discuss about the research framework for development of Online PBL IT Security subject. The design of testing method also will be discussed here. Finally the storyboard design of the prototype will also be highlighted.

**Keywords**—*problem solving method; problem based learning; testing method; research framework*

### I. INTRODUCTION

The analysis of problem solving steps in an online problem based learning (PBL) is a project that will find out the students performance in technical course after using the PBL method in their study. This project also will find out the suitable problem solving steps that can be proposed in an online PBL environment that can be used in solving problems related with the Network Security topic from Information Security subject.

Network Security is chosen based on previous research of PBL that said the product development required investigation of topics such as databases, network security, scripting languages and web site design by using the PBL methods [2]. The PBL case consisted of a computer network security scenario, involving both theory and practical work [1]. PBL method also has been used within a Systems and Network Security module within a diploma programme [4]. They proved that Network Security can be considered as a relevant topic for PBL methods. Although they are not focussed on Network Security itself, but to some extent, their project related with Network Security.

Pioneering by McMaster University, Hamilton, Ontario, Canada for medical course, there are hundreds of research that been held on this method nowadays. From a lot of sources that study on PBL, they prove that compared to traditional lecture-based instruction, PBL improves student understanding and retention of ideas, critical thinking, communication and

problem-solving skills, as well as the ability of students to adapt their learning to new situations – the cornerstone of lifelong learning [5].

There are a lot of universities that have been built around the world. The problem is, when products of universities nowadays did not fulfilled the industrial requirements. Many undergraduates lack of personnel characteristics, failed to meet industrial need that lead to unemployment problem for the country. Neo and Neo suggested that current research is the grew out of the need to create a workforce that was able to solve problems in any given situation, and utilize strong thinking skills [9]. So, by using the PBL method, the problem is hoped will be resolved.

The problem-based learning environment has many elements of the constructivist learning model, as it also requires that the students become active participants in the learning content and learning process [8]. As active participants in their own learning, students will better able to understanding the concepts of the learning. It is not only guiding them to be better understood on the contents of the subject, it also will develop students' attitude to fulfill the requirement.

Problem solving is the complex and high order of ability and fundamental capability [3] that has to be pursued and evaluated in education in any academic subjects [7]. These researches suggest that any academic subjects need to have their own problem solving steps. With the differences with each subjects content, a slide different of problem solving steps might occurs in every subjects. As an example the problem solving steps in Historical subject dissimilar with the solving steps in Mathematics.

Also there are common processes of problem solving such as the hypothesis and plan to problem solving, experiment / carrying out problem solving results and also the evaluation session [6]. These are the common steps that normally apply in solving any problem.



The suggested problem solving steps for this project consist of six steps. The explanation of each step is described in table 1 below:

TABLE 1. SUGGESTED PROBLEM SOLVING STEPS

Steps	Explanation
Problem	<i>Define The Problem.</i> Explore the issues. Explain the meaning of problem scenario based on own understanding.
Known	<i>List Of Known.</i> Explain the previous experience and knowledge that related with the problem scenario.
Unknown	<i>List Of Unknown.</i> List out all possible knowledge needed that related with the problem.
Action	<i>List Of Action.</i> List the needed action to solve the problem. Divide the action between group members.
Solution	<i>List Of Solution.</i> List all the solution and any information gathered from the action properly.
Report	<i>Write The Report</i> Combine all the output from the above steps in paper/online report and submit it to the learning journal.

The suggested of problem solving steps for this project consist of six steps. It starts with Problem, Known, Unknown, Action, Solution and Report. As for the problem based learning will normally starts with giving students the problem to solve, so the researchers has suggested problem for the first step, students will explore the issues and explain the issues based on their own understanding.

The second step is Known. In problem based learning, students need to find out students prior knowledge on the problem given. This will guide them to monitor on how students use their prior experience with the given issues.

The third step is Unknown. In this step, student will explore what they need in order to solve the issues. They will list the information that they need, the related step need to solve the problem and any additional data that will strengthen the learning journal.

The fourth step is Action. In this step, students will list out the needed action to solve their problems. As for this Online PBL, the researchers have prepared the required action to solve the problem such as by referring to notes, books, and internet resources and so on. For PBL, this action step might be different subject.

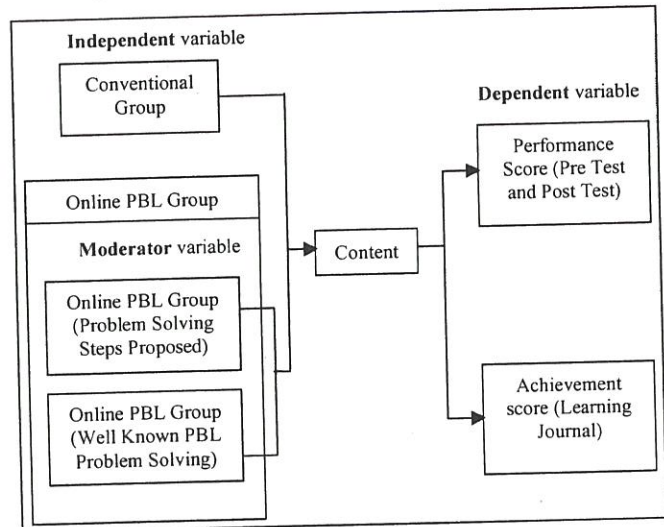
The fifth step is Solution. After filling the action form, students will guide to answer the solution part. In this part, they will conclude all of the info gathered. They also can suggest how to solve the given problems.

The last step is Report. Report is normally known as Learning Journal when it comes to online learning program. In Report step, students can review all the answers that they have gather, rearrange these answer, and repair any error occur. After final review, they will submit the Learning Journal to their facilitator for evaluations.

## II. RESEARCH FRAMEWORK

A research framework is proposed to sketch a possible path of action or to present a chosen approach to a thought or idea of this project. It will present the general idea of the project and connect to all inquiry aspects of project as shown in Diagram 1 below.

DIAGRAM 1. RESEARCH FRAMEWORK FOR ONLINE PBL



A double T-Test experimental design will be implemented in this research. The first T-Test is to analyse students' performance in PBL group compare to the students' performance in conventional group. The second T-Test is to analyse the students' performance in PBL Group that use problem solving steps suggested compare to the students' performance that use well known PBL problem solving steps.

The independent variables are learning environment, Online PBL which is divided into two group (suggested problem solving step and well known problem solving step) and Conventional PBL. As an example, this class consist of 90 students. These students will be divided into two groups. First group with 30 students will learn in conventional class environment. This group is called as Conventional Group. While the second group with 60 students will learn by using an Online PBL environment. This group is called as Online PBL Group. This Online PBL Group will be divided into other two groups. First Online PBL Group with 30 students will use problem solving steps suggested while the other 30 students will use the well known PBL problem solving steps.

The dependent variables are the students' outcome (performance and achievement score). After the learning process, students in this class will be test by using post test.



They will also submit their learning journal at the end of the week. So, by using the post test and learning journal, student result will be analysed.

Two Online PBL learning program with difference problem solving steps will be designed and developed for this project. The first problem solving steps is suggested by this research. This problem solving steps are analysed as an appropriate one to be used in Network Security and Online PBL environment. The other problem solving steps is adopted from general PBL which is the well known problem solving steps.

Contents of the Online PBL will be designed by using the ADDIE method. The ADDIE method is a well known multimedia development methods. As for this project that will produce an Online PBL in multimedia scope, ADDIE method is the most suitable method that will be used.

About 90 students from the FICT, UTeM will be requested to participate in this study. This is because the chosen subject, Information Technology Security is offered only for BITM (majoring Media Interactive) and BITS (majoring Software Engineering) students. This subject is offered for every semester, each semester for a single course. If in this semester it is offered for BITM, so the next semester, it will be offered only to BITS students. As for other courses such as BITD (majoring Database), BITC (majoring Computer Networking), and BITI (majoring Artificial Intelligent), they already have their own security subject that based on their courses.

The instructional material of this study will be based on the topic "Network Security" of the course entitled "BITS 3423: Information Technology Security", offered by FICT, UTeM.

### III. DESIGN OF TESTING METHOD

This testing method is important in guiding the researcher to monitor and conduct the research in more structured way.

DIAGRAM II. THE FLOW OF TESTING PLAN

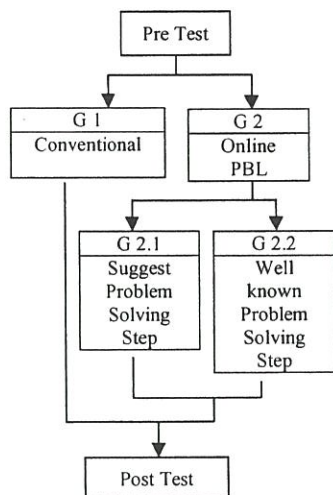


Diagram II shows the testing plan flow that will be executed in the implementation phase which is the fourth phase of

ADDIE methods. At the early stage of the learning process, all students of the class will answer Pre Test questions to assess students' prior knowledge on the topic. This pre test is to find out

After that, students will be divided into two groups. These groups will learn in different environments. The first group will learn in a conventional class environment while the second group will learn in an Online PBL environment. The first group will learn in a lecture hall while the second group will use a computer lab. Computer labs are needed for they are equipped with computers and internet line. This will facilitate the researchers of the project to monitor students and allow students to access the Online PBL.

As shown in Diagram II, the second group of students will be divided into two groups. The first group will use computer lab one, while the second group will use computer lab two. These two groups will use different problem solving steps.

After this learning period that is expected last for one week, post test will be distributed to students. By using the post test, the evaluation will be conducted. The students' results of these groups will be compared based on their performance. Besides, the learning journals that have been submitted by students will be evaluated by using certain marking schemes. Both test paper and learning journal will be used to assess students' performance.

### IV. PRELIMINARY DESIGN OF PROTOTYPE

This paper will highlight some storyboard design for the proposed prototype as shown in Figure 1, Figure 2, Figure 3, and Figure 4.

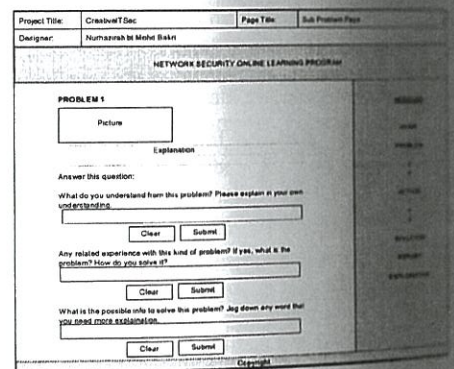


Figure 1. Problem Interface

Figure 1 shows the problem interface. After choosing the problem, students will view this page. In this page, they will answer three questions. The first text box is defining the problem which is the Problem steps. In the second text box, they will fill in their related experience with the problem which is the Known step. This step is to find out students' related experience or their prior knowledge. The third text box is prepared for students to list out any strange words or questions, and any info needed to solve the problem which is for Unknown step.



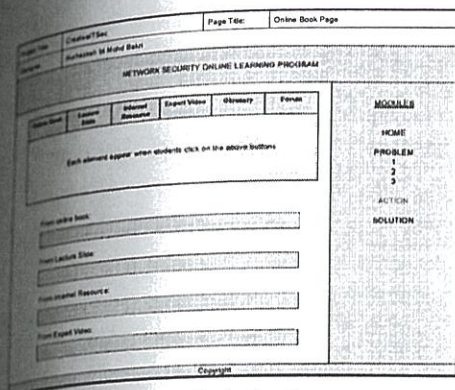


Figure 2. Action Interface

Figure 2 shows the action interface. Student will use this interface to collect any related info. They can access the info needed from online book, lecture slide, internet resources, expert video, glossary and forum via the provided link in this interface.

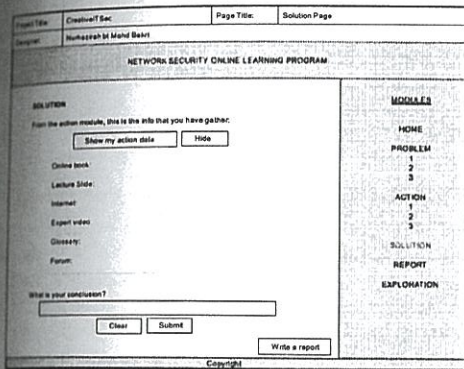


Figure 3. Solution Interface

Figure 3 is the solution interface. In this phase, student can view their collected data from the Action phase. By viewing these data, students will develop their own solution on the problem. The solution might include the action of solving the problem, and summarize of the overall steps.

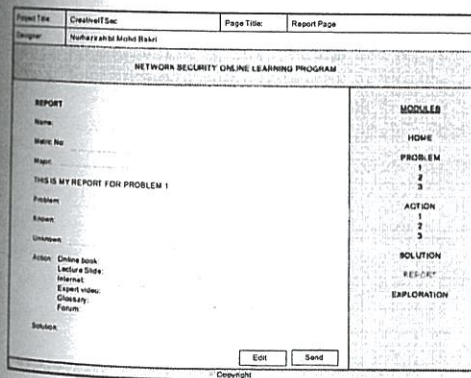


Figure 4. Learning Journal Interface

Figure 4 shows the learning journal phase. This phase represent the report phase of the solving steps. In this phase, students can view all the info that they have fill in the previous step. Students will use this interface to review their learning journal before submitting to the facilitators.

## V. CONCLUSION

The studies on PBL keep increasing year by year. There are more innovations found by researchers around the world especially by academician in PBL fields. It is showed that this method is really applicable as the best and most popular learning methods. Although there are a few disadvantages occur by using this method such as time consuming, lack of references, and so on, but with a few of innovation, these weaknesses is out of consideration. The most important thing to be achieved for academician is to produce qualified human resources to the world.

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## REFERENCE

- [1] C.S. Cheng & C. Beumont. (2004). "Evaluating the effectiveness of ICT to support globally distributed PBL teams"
- [2] D. Delaney & G. G. Mitchell. (2003). "PBL applied to software engineering group projects", Department of Computer Science, National University of Ireland, Maynooth, Ireland
- [3] F.C. Goldstein, & H.S. Levin (1987). "Disorders of reasoning and problem solving ability". In M.Meier A. Benton, & L. Diller (Eds.), "Neuropsychological rehabilitation". London: Taylor & Francis Group. In J.H. Kim, (2007). "Key competencies needed for future in the republic of Korea – Problem solving ability: Ability to integrate". Korea Institute of Curriculum & Evaluation.
- [4] L. Uden & C. Beumont. (2006). "Technology and Problem-Based Learning," Published by Idea Group Inc. ISBN: 1-59140-744-3, pp. 136
- [5] N. Massa, R. Audet, J. Donnelly, F. Hanes, & M. Kehrhahn. (2007). "PHOTON PBL: Problem-Based Learning in Photonics Technology Education" in <http://spie.org/etop/2007/etop07methods1.pdf>.
- [6] Project2061(American Association of the Advancement of Science)(1989). Science for All Americans, A Project 2061 Report on Literacy Goals in Science, Mathematics, and Technology, Washington, D.C.: American Association of the Advancement of Science. In J.H. Kim, (2007). "Key competencies needed for future in the republic of Korea – Problem solving ability: Ability to integrate". Korea Institute of Curriculum & Evaluation.
- [7] R.J. Sternberg, & P.A. Frensch,(Eds)(1991). Complex Problem Solving: Principles and Mechanisms. Hillsdale, N.J.: Lawrence Erlbaum Associates. In J.H. Kim, (2007). "Key competencies needed for future in

the republic of Korea – Problem solving ability: Ability to integrate”.  
Korea Institute of Curriculum & Evaluation.

- [8] J.R. Savery & T.M. Duffy, (1995). Problem-based learning: An instructional model and its constructivist framework. *Educational Technology*, September-October, pp 31-38. In Neo, T.K. & Neo, Mai. (2005). Engaging students in problem-based learning (PBL) in

Malaysian classroom – A constructivist approach. *International Conference on Problem-Based Learning 9-11 June 2005, Lahti, Finland*.

- [9] T.K. Neo, & M. Neo, (2005). “Engaging students in problem-based learning (PBL) in Malaysian classroom – A constructivist approach”. *International Conference on Problem-Based Learning 9-11 June 2005, Lahti, Finland*.