

The Development of Active Learning Website for Learning Science

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Abstract—Active learning takes place when students are present in the classrooms' activity and actively engaged with the subject matter. Active learning via website focuses on the content delivery and active engagement with the materials. However, the emergence of web-based learning environment which is supported by the changing technology at the present, is neglecting the students' active participation in the learning processes. As a matter of fact, through the enhanced learning environment by the supported technology, students are able to play the role of an active learner. This paper examines how today's web-based learning environment can be better designed for students' active learning as in science subjects. This research proposed the implementation of learning strategies to encourage active participation among the students.

Index Terms—Active learning, passive learning, web-based learning, learning strategies.

I. INTRODUCTION

The internet or web has become an important changing agent in education field at present. Numerous websites provide opportunities for students to receive information without having time and places constraint [1]. Additionally, web-based learning can fosters active learning, where students having control on their own learning processes. Thus, students have to learn to be in charge of their own learning and become actively involved in the learning processes [2].

Learning by doing is the most common learning processes as indicated by many group of educators [3]. It is also indicated by Silberman where he mentioned that "*students learn best by doing*" [4]. Felder and Brent also further asserted that active learning as engaging students in doing something other than listening to a lecture and taking notes to help them learn and apply course material [5].

Active learning promotes student-centered learning. According to Açkgöz [6], in active learning particularly, student takes the responsibility of his/her learning and also given the opportunity to make decisions about various dimensions of the learning processes. As a result, the skills of problem-solving, critical thinking and learning to learn can be nurtured [6]. This is due to the fact that through active learning, students carry out most of the tasks, using their wits to generate ideas and attempt to solve the given problems and finally able to apply what they have learned [4].

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II. BACKGROUND OF PROBLEM

The advantages of active learning have been frequently demonstrated particularly for learning sciences [7]. Several researches have been conducted to prove that students learn best when they are engaged with course materials and actively participating in the learning processes [8]. As indicated by Clark [9], through active learning, students are engaged in activities such as conceiving, designing, creating, operating, exploring, analyzing, communicating, reflecting, or actually using new information or experiences. Despite that, studies have shown that the implementation of active learning at present is not widely spread [10].

Active learning can be enhanced and supported by technology. Currently, the integration of technology in education field will provide with the opportunities for active participation, collaboration and social interaction [11]. Active learning can also be implemented via online learning setting (web-based) [12] and it is hoped to be able to shift the passive learner towards becoming an active learner. The benefits of active learning versus passive learning are well-recognized. Cottrell [13] had listed the differences between active learning and passive learning as presented in Table I.

TABLE I: ACTIVE LEARNING VERSUS PASSIVE LEARNING

<i>Active Learning</i>	<i>Passive Learning</i>
Students will be looking for means to get involved in learning activity.	Students will be waiting for directions and information to be given to them
Students make conscious effort to make sense of, and finding meaning. Usually results in deeper understanding.	Students replicate information and being ignorance. Unaware of the meaning.
Students involved in reflection and self-assessment.	Students do not reflect on what they have learned.
Students' attention span is longer because their mind is optimally engaged.	Students may easily become bored and tired.

Creating active learning environments can be challenging in face-to-face meetings and it may be equally challenging in online settings [14]. Thus, understanding the pedagogical potential of technology tools for active learning is an important step in successfully implementing online learning [14]. Other than that, the motivation of the learners in learning in online settings has to be considered as well. According to Talib and friends [15], students' motivation towards learning may be influenced by several factors where active learning strategies are one of the contributing factors. This is agreed by Austin and Mescia [16] who cited that an active learning environment incorporates active learning strategies where

students have greater chances for exploration of their meaning, attitudes and values.

The current concern is on which is the suitable learning strategies for online learning environment. For educators developing an active learning environment for online learning, there are several factors that need be considered [16]. Firstly is the course design. Next, is the context and environment in which learners will be manipulating, and finally, the instructional tools and techniques for delivery. These factors are crucial for active learning is not possible in online settings unless the interaction is intentionally planned and promoted by the educators [17].

Mantyla [18] listed several principals to design a good active learning in online environments. Activities should 1) have a definite beginning and ending; 2) have clear purposes or objectives; 3) have complete and understandable instructions; 4) have a feedback mechanism; and 5) description of the technology or tool being used in the exercise is provided. To attain to these principles, the selection of the appropriate learning strategies or approaches continues to be the main factors for developing online learning website.

In this research, we presented a web-based active learning for learning science that we called *Sci-On: Active Learning Activities for Science* (see Fig. 1). It incorporates the implementation of collaborative learning, inquiry-based learning, and problem-based learning as selected learning strategies for inducing active learning among the students.



Fig. 1. The main page of Sci-On: active learning activities for science website.

III. DEVELOPMENT OF ACTIVE LEARNING WEBSITE

In several series of former projects by Nurbiha and colleagues [19] as well as Noor Dayana and friends [20], decisions are made to come up with an integrative online learning environment that gathers active online learning strategies; collaborative learning, inquiry-based learning and problem-based learning. Of each of the learning activities incorporated in the website, the principles by Mantyla [8] have been implemented. The implementation of the designated principles for collaborative learning (one of the applied learning strategies) is simplified in Table II.

TABLE II: SUMMARY OF THE IMPLEMENTATION OF ACTIVE LEARNING PRINCIPLES IN SCI-ON

Active Learning Principles	Implementation
Having definite beginning and definite ending	Initially, students have to register their name to system and ended learning of the day by completing the given task.
Clear purpose and objectives	Objectives of learning are clearly stated before proceed with the given task (see Fig. 2).
Complete and understandable instructions	Instructions are designed to be as explicit as possible by providing numbered instructions and arranged in sequential manner (see Fig. 2).
Feedback mechanism	Students are given a list of their group members upon successful registration to the system (see Fig. 3).
Description of the technology and tool being used in the system	Developer provides guidance on how to conduct discussion using the discussion board. The purpose of the discussion and the outcomes of the discussion are explained before-hand.



Fig. 2. The clear instructions of the task and how to carry out the task adapted from Nurbiha and colleagues [19].



Fig. 3. One of the many form of feedbacks provided by the system adapted from Nurbiha and colleagues [19].

IV. CONCLUSION

For successful online active learning activities, several prior steps should be reflected on. The present research has demonstrated on how the principles for designing active learning website are possible for implementation. Upon this project, the present research summons the educators or stakeholders to consider structural planning of learning strategies and approaches for developing active online learning website for students' active learning.

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