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37. PROBLEM BASED LEARNING THROUGH MOBILE APPLICATION

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Extended Abstract

Thinking skills involve the manipulation of knowledge rather than memorizing the input is defined as High order thinking skills (HOTS) [7]. This thinking skills require comprehension, analysis, synthesis, application, and evaluation. HOTS involves more than just receiving a knowledge but further action in cognitive thinking is required so that students will achieve deeper understanding on the learning material, create new knowledge, solve the problems that require more than one possible answer, create original material, or make decisions [6].

The formal lecturing that is still applied in most teaching is a conventional learning method that only offers the formal learning environment. This formal learning shows weaknesses when it does not promote higher-order thinking skills, dependent on teachers, lack in students' engagement, and student are bored. Therefore, the researchers developed a mobile app to change the formal learning environment into informal learning environment.

The advantage of using mobile learning is that it is a flexible tool where students can learn anytime and anywhere. M-learning encourages a self-paced learning environment where students could learn anytime and anywhere according to their own preferences [8]. In addition, most students prefer to use mobile devices as a new tool for learning because the devices are portable and can be accessed anywhere [10]. Mobile devices provide learning on the go and is independent of time and space [9].

Many researches that were done by scholars have shown positive results of using mobile learning that offers flexibility in learning. A research that was done shows that, 90.1% of 374 lecturers agreed that mobile learning offers more flexibility to students and teachers.1 Another research done also agreed to mobile learning usage because it provides freedom to manage their learning time.12 and students can learn during leisure time such as before sleeping and travelling on the bus.3

As the learning process for postgraduate students is no more a spoon feeding approach, students need to expose themselves in social constructivism learning which is student centred learning. Constructivism is a theory of learning which student not only receive and store knowledge given by the teacher but they are constructing new knowledge as well.2 The HOTS Flash application was developed based on constructivism theory where students will construct their own knowledge after a series of learning. This theory will link the facts with the students understanding. Inductive method of reasoning is a process of transformation of specific knowledge to general knowledge. In a guided inductive discovery lesson, hereafter called the inductive approach, the students, not the teacher, state the generalization following their examination of specifics.7 In this research, the researchers have implemented higher order thinking levels into the learning process through the mobile application software. Interactive multimedia program will develop students with high order thinking. Substantial levels of higher-order thinking can be supported and maintained by approach of multimedia program based on a situated learning environment [5] .In the application software, the learning design is constructed based on problem solving skills approach where users have been asking questions related to the course content but using Higher-Order Thinking question levels. Critical thinking process and utilizing learner collaboration among students can be developed through problem-solving technique.11 In the process, students construct new knowledge and understanding where they are able to make decisions through their deep understanding of the topic area.4

The mobile app is one of the technology that can create learning variation. This variation is important because it can create a change of learning style according to technology changes based on the current curriculum. From this point, the researchers take the appropriate instructional design so that the growth process of mobile app will be more systematic and structured. In addition, the mobile app design should be planned carefully so that it is an interactive and interesting application.

The research design used in this research is descriptive analysis in quantitative design to evaluate the usefulness HOTS Flash app in the learning. A questionnaire is used as the instrument to collect the responses according to research objectives. The questionnaire was distributed to the respondents by online medium which is Google Docs form.

This research was conducted to develop HOTS Flash application and test the system functionality and usability to a group of users. The HOTS Flash application was developed based on constructivism theory where students will construct their own knowledge after a series of learning. In this research, the researchers implemented knowledge of constructive theory with problem based learning approach into the learning process through the mobile application software. In the application software, the learning design is constructed based on problem problem-based learning approach where users have been given a few situations that follow with questions related to the course content using Higher-Order Thinking question levels.

The samples consisted of 16 students, who are enrolled in MPPP 1223 (Authoring System) course in semester 1-2014/2015 and another 10 students in semester 2-2014/2015. They comprised of full time students and part time students who are in the first year of study in Master program. All of them have mobile gadgets such as mobile phone and tablet computer with Android Operating System. Their gadget has been installed with HOTS Flash application to test the acceptance part of this study. The questionnaire was given to the respondents in the classroom. The questionnaire has two sections, Section A and Section B. Section A consisted of demographic background of the respondents that asked about the gadget model, category of student, the skill level of using Adobe Flash Professional, the frequency of using application based on education, and the purpose of using a gadget.

Conclusion

From this research, the results showed that the approach applied in this mobile application have encouraged students to be able to construct knowledge based on the learning process when using this application. The programming skills of creating an animation using Adobe Flash Professional level is related to the understanding of the students when dealing with the errors or problems faced in the process of making the animation work and how the students can identify why the errors appear in the first place. Finally, relating the problems with the basic theory or process involved in learning.

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38. SPARKING CREATIVITY AND ENHANCING LEARNING OF CHEMICAL ENGINEERING STUDENTS IN UNIVERSITI TEKNOLOGI PETRONAS (UTP) VIA COOPERATIVE LEARNING

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Extended Abstract

The chemical engineering program in Universiti Teknologi PETRONAS (UTP) has attracted many bright students, locally and internationally. There are two enrolment per year, of which there are around 100 to 150 students registered per intake. Each of the academic staff in the chemical engineering department teach one course each, and to meet the Engineering Accreditation Council (EAC) requirement, these students are often divided into two groups. Yet, the class is still considered a big class, and usually, there is always a tendency of the lecturers to teach the students in a traditional way, i.e. via one way communication and one man show.

One of the learning theories that can enhance learning is known as cooperative learning. Cooperative learning is an instructional method where students are placed in small groups so that they work together to maximize their own and each other's' learning [1]. Cooperative learning is also claimed to reduce the occurrence of unpleasant situation in a group work [2]. Many world renowned engineering education specialists recommended the use of cooperative learning and this confirms the effectiveness in cooperative learning in higher education [2]. This is supported by another study, which suggested that the students dropped out the college are mainly for two reasons: failure to establish a social network of friends and classmates, and failure to become academically involved in the class [2]. Many researches on cooperative learning were carried out in US, and the impact of cooperative learning can be classified into four aspects: i) Academic Success, ii) Quality of Relationships, iii) Psychological Adjustment and iv) Positive Attitude towards College Experience.[2]

Cooperative learning can be adopted formally or informally [1]. The introduction of active learning in the classroom for example is an informal cooperative learning strategy. The students will work in pairs for a few minutes after 10-15 minutes lecture to achieve a joint temporary goal, as assigned by the lecturer in the class. In one lecture hour, an informal cooperative learning session can be introduced up to 4 times, with each session lasting for up to 4 minutes.[2]

A formal cooperative learning is a more structured activity, in comparison to the active learning [2]. Five essential elements that must be embedded in a structured cooperative learning are: positive interdependence, face to face promotive interaction, individual accountability, teamwork skills and group processing [3]. These elements shall promote the group to become a high performing cooperative learning group, and effectively learn.

Based on the index of learning styles survey made in January 2015 and May 2015, using an instrument developed by Felder and Solomon (1992) [4], of four batches of chemical engineering students in UTP, majority of the students are found to be active learners, sequential learners as well as sensing learners. This suggest that an active learning strategy such as cooperative learning [1], should be adopted to ensure the students can sustain their interest in the classroom, via the collaborative and cooperative nature of classroom activities.

In addition to the findings from the index of learning styles survey made for the students, our students generally complained that they could understand the lecture, but often unable to solve the problems given to them. Thus, combining this scenario with the old teaching style, the students can get easily bored with the courses, and practically, are not really learning.

By observing this particular gap, it is brought to our attention, the course instructors of Kinetics & Reactor Design (KRD), which is offered to the 3rd year 1st semester students, to initiate a collaborative and cooperative learning activity together with the students. The main aim of this activity is to promote peer to peer learning and improve the performance of the students in this particular subject. In semester May 2014, 11 students out of 176 students failed this subject and the average score is C+. Thus, it is important for us to ensure the students can learn better via cooperative learning strategy, hence improving their performance in this course.

Our innovation is the integrated group project for this course, of which the students are tasked to deliver two projects. The students are required: i) To create a creative project, such as preparing a teaching module, song writing, or developing board game that demonstrated their understanding of the subject matter, which must consist the element of higher order thinking (HOT) and ii) To solve an open ended problem in a team, which is related to reaction engineering course. The output of these projects are showcased in each group e-portfolio. Three pillars of cooperative learning i.e. positive interdependence, promotive interaction and individual accountability are addressed in each stage of the project. Communication between the instructor and the students is made via social media such as facebook.

In the early semester, the students were asked to conduct two surveys, which consisted of index of learning styles and personality plus [5]. These are important i) to understand the nature of the students in general, ii) to assist with group dynamic. The grouping for the students

are done in the following criteria, which is a modified version from the one developed by Felder and Brent [1]

i. A group of 5-6 students
ii. A mix of high CGPA and low CGPA students
iii. A mix and balanced ratio of males and females
iv. A mix of ethnics
v. At least one international student in each group (UTP has almost 30% international students from overall students' population)
vi. At least three out of four personalities (choleric, melancholic, phlegmatic, sanguine) are represented in the group

Each project were given approximately 4-5 weeks to be completed. The course instructor will be the subject matter experts to evaluate the following using the rubric created, which covers i) Content , ii) Depth and iii) Creativity. The demonstration and the presentation of the creative project is required to be recorded and posted in YouTube, and this shall be embedded in their e-portfolio. This project gives 20% of overall coursework marks out of 50% allocated to the students.

The e-portfolio of the students must consist of the following elements: i) Biodata of the group members and their aspirations, ii) Reflection and summary of what the students had learnt, iii) Group Project Report with the video. The overall winner for all is also awarded with some special gifts.

This integrated cooperative learning activity addressed several things, namely i) Assisting active students to learn better, ii) Instilling high order thinking among the students and iii) demonstrate the values of teamwork. The students found that these activities engaged them in learning, sparked their creativity as well as improved their performance in the final exam.

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39. E-SITE INVENTORY

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Extended Abstract

Site inventory is an important stage of studio-based design project where it is a process of determining the elements and existing condition of a particular site that will give impact to the later design proposal (Russ, T. 2009). Site inventory is a compulsory stage in a particular site design project. In any design project, inventory of the site is always needed in order to justify the proposed adjustment of the site where these justification need to be based on certain analysis and evaluation of the inventory (Steiner, F. 2008). Design-based studio courses of built environment schools and faculties mostly use student centred learning (SCL) and problem based learning (PBL) approach in conducting their studio project work. This will involve site inventory task as part of the design process. By using both SCL and PBL approaches, site inventory task will be carried out where through thoughtful inventory it may improve the current condition and environment of the site.

Current practices of site inventory in design-based studio courses (which includes architecture, landscape architecture, town planning, surveyor and etc.) were carried out by students using many different tools. Students normally need to bring their cameras, GPS handhelds, note books and hardcopy maps which resulted in too many tools to handle on site. Handling these many tools sometimes bring difficulties to the students in carrying out their site inventory where they face problems of unorganised and inaccurate site inventory task. Furthermore, the current practices do not allow the site inventory task to be monitored closely by the lecturers and verification of data collected on site are hardly verified by the lecturers.

Hence, this research has developed an e-site inventory mobile application version 1.0 to encounter these many problems. This all-in-one tool mobile application was developed to provide user-friendly and intuitive mobile apps for site inventory tasks. It allows user to accurately collect location (x, y coordinate), capture images, insert notes and draw rough sketches of information and ideas during data collection on site by using one tool such as smart phones or tablets. These four functions work well and have been tested on site and it has successfully assisted students in data collection.

Students of Year 2, Year 3 and Year 4 of Bachelor of Landscape Architecture, Universiti Putra Malaysia were used as respondents to test this mobile application. This tool was used in their design-based studio courses where students used e-site inventory mobile application version 1.0 for their site inventory task project. This site inventory task project were assigned by lecturers online using this mobile applications and then students were asked to carry out their site inventory task by just using their smart phones or tablets that were installed with e-site inventory mobile application version 1.0.

The result of this test shows that respondents only brought one tool during their site inventory task. By using this only tool (either smart phone or tablet) installed with e-site inventory mobile application version 1.0, the students carried out their site inventory which includes capturing images, taking notes on maps and collect locations accurately and in a well organised manner. Respondents were also observed to not have difficulties handling too many tools on site which helps them to move around on site easily. The development of e-site inventory mobile application version 1.0 has improved how the site inventory task is being conducted. This mobile application has successfully facilitated the site inventory task of design-based studio courses where students were equipped with current technology while on site. This e-site inventory mobile application is an all-in-one tool which is marketable and has the potential to be commercialised not only for academic purposes but also suitable to be used by design consultants/firms and site surveyors.

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