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Nurturing Innovative and Creativity through Open Ended Laboratory: JKKP Experience

Noorhisham Tan Kofli^{a,b,*}, Sharifah Najiha Badar^a, Norliza Abd. Rahman^a, Siti Rozaimah Sheikh Abdullah^{a,b}

^aDepartment of Chemical and Process Engineering, Faculty of Engineering & Built Environment, Universiti Kebangsaan Malaysia, Bangi, 43600, Selangor, Malaysia

^bCentre of Engineering Education, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia Bangi, 43600, Selangor, Malaysia

Abstract

Innovative approaches that require active involvement of the students in the learning activities are necessary to ensure the targeted learning outcomes are achieved. An open ended laboratory (OEL) assignment is introduced as part of the effort to provide suitable learning platform. This paper describes the implementation of the OEL and its impact on the overall students learning experience. They are graded based on the originality, creativity and innovation of their laboratory assignment as well as presentation of results and discussion. Initially we found the students faced some difficulties because they were not familiar with such laboratory assignment. Marks for innovation and creativity in the OEL assignments were found to be more than 50%, indicating that students innovative and creativity were nurtured during this assignment.

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Keywords: Independent learning; learning outcomes; open-ended laboratory; OEL assignments

1. Introduction

Teaching innovation and creativity is such a daunting task for any academician since creativity and innovation requires effective strategies and frameworks (Serrat, 2009). The definition of creativity is an ability to transcend traditional ideas, rules, patterns, relationships or the like to create meaningful ideas, forms, methods whereas innovation defines as the act of innovating such as the introduction of new things or methods (Dictionary.com). It is believed that, creativity and innovation flourishes in place where open ideas are promoted, creating

* Corresponding author. Tel.: +60-012-396-6379

E-mail address: maverick@eng.ukm.my

environment that can inspire people (Druker, 1985). Based on these, the Department of Chemical and Process Engineering (JKKP), Faculty of Engineering and Built Environment, UKM has created an assignment called Open Ended Laboratory (OEL) as platforms to promote and nurture creativity and innovation since 2008. This type of assignment is also required in the context of outcome based education (Webb, 2007) which has been the practice of the faculty (Jalaini et al, 2006).

OEL is a group laboratory assignment (Noorhisham et al, 2009) where students need to come out with an experiment related to a general topic given to them in that particular semester. Each group has to come out with a title, determines the objectives and scopes as well as able to list all the apparatus needed. They will be given time to complete the experiment and submit a report of their experiment. Final presentation is executed in a form of poster competition session and the judges will give them marks based on their knowledge, presentation, creativity and innovation.

This article reports on our experience in trying to impart creativity and innovation in the curricular by introducing the open ended style assignment. OEL is hoped to foster creativity and innovation by not limiting the type of experiment choices.

2. Methodology

2.1. Students

All students in the third year of their studies (about 60 students) are involved in this laboratory. They were divided into a group of 3 - 4 students and this resulted in 15 groups. Each group is required to prepare a report on the objectives, scopes of the experiment, the necessary apparatus together with the methodology and present the results in poster competition session.

2.2. Assessment

Judges evaluation is done during the poster session presentation which is organised in competition format. The marks are given based on the poster appearances, communication skills, creativity, innovation as well as team work. Each judge (normally 2) received a marking template consisting of 21 questions related to these elements using Likert scale of 1 to 5. Team that collected the highest average point is awarded first place.

Students survey is also distributed during the presentation asking students opinion on creativity and innovation during the assignment using Likert scale of 1 to 5 on five questions.

3. Results and Discussion

Evaluation from judges during presentation for creativity and innovation are shown Figure 1 and 2. All groups managed to score more than 50% for both Chemical and Biochemical engineering program.

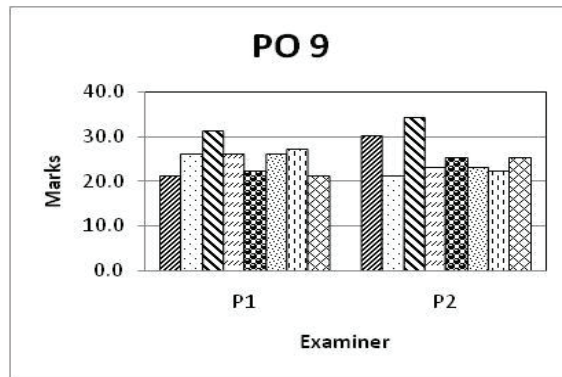


Fig. 1. Marks scored by different examiners for each group (Biochemical Engineering program)

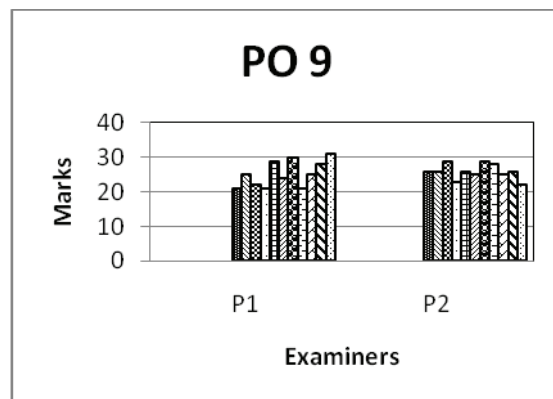


Fig. 2. Marks scored by different examiners for each group (Chemical Engineering program)

Since 2008, OEL was introduced to the third year students resulted in positive reviews amongst students and academics. In addition we believed that this type of assignment could also become a platform to nurture creativity and innovation due to the fact that the experiment is not following conventional approach (Norliza et al, 2011) whereby students are running the experiment based on manual given to them. During the first time we introduced this laboratory to students, we observed that the students struggled to complete the assignment as they were not used to the approach. As year goes by, we found students able to come out with varieties of experiment titles indicating creativity and innovation in their experiment (Noorhisham et al, 2009). Some groups managed to relates the experiment principles to local and domestic problem. This indicates maturity of the students in understanding the concept and their ability to apply to real problem.

Student survey (see Figure 2 and 3) also indicated that the assignment has given them chances to foster creativity and innovation. All students from Chemical programme agreed that the assignment has given them chances to be creative and innovative as 47% strongly agree, 47.6% agree and 5.4% % neutral. As for Biochemical engineering programme, 40.4% strongly agree, 49.5% agree and 10.1 % neutral. None of the students from both programme answered disagree or strongly disagree that the assignment did not benefit them at all.

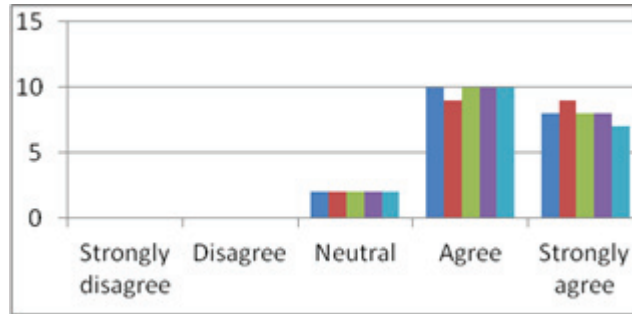


Figure 3 Results of student survey for Biochemical Engineering students

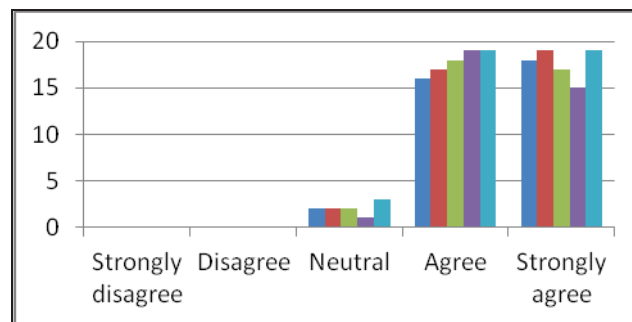


Figure 4 Results of student survey for Chemical Engineering students

However, student creativity and innovation in the experiments they were proposing sometimes hindered by the time and cost incurred to the department. There are few experiment proposed by students get rejected due to unrealistic budget and unavailable facilities. The department is hoping that this problem of cost and logistic could be reduced to a minimal as preparation for promoting creativity and innovation is vital in student development. As shown by these results, this approach benefits students and also created an opportunity whereby creativity and innovation can be fostered.

Conclusion

As a conclusion, we found out that this Open Ended Laboratory (OEL) assignment can be used as a platform to nurture and foster creativity and innovation. It also managed to polish other skills such as team work, critical thinking, decision making and other soft skills especially during the assignment as they need to plan, organise and executed the experiment. Poster presentation in competition format also promotes healthy competition amongst the group.

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