THE EFFECTIVENESS OF OBJECTIVE STRUCTURED PERFORMANCE EVALUATION (OSPE)-BASED SETTING VERSUS CONVENTIONAL PRACTICAL IN ENHANCING KNOWLEDGE AMONG MEDICAL STUDENTS

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Abstract

Introduction: Flipped classroom is currently adapted in the medical curricula where students are required to prepare for class activity by utilizing technology to gather knowledge and subsequently to engage in teamwork to solve cases and practice problems during classes. Objective Structured Performance Evaluation (OSPE)-based setting is one of the innovation in flipped classroom to enhance teaching and learning experience in replacing a conventional practical.

Objectives: To evaluate the effectiveness of OSPE-based setting versus conventional practical in enhancing medical students’ knowledge in medical genetics.

Methods: Teaching materials were uploaded on University Kebangsaan Malaysia (UKM) learning platform, iFolio a week before the session started. Students are required to read the materials and watch videos in preparation. There were 10 OSPE stations which consist of questions on gene mutations and mutational analysis. Forty groups of Year One Medical students (4 students per group) participated in this study and they were required to answer every station. Each station must be completed within 10 minutes. Marks were collected at the end of the session and their experience were collated through online questionnaire. Subsequently, students’ performance were tracked at the end of module examination.

Results: Among 40 groups participated in the OSPE session, the mean of the total marks scored is 92.025%. Majority of the students agreed that OSPE mode of learning medical genetics in replacement of practical mode increased their understanding on genetic mutations and mutational analysis and they are more prepared for the end of module examination. Their average marks increased in the end of module exam (68.4 ± 11.6) when compared to the previous session (59.3 ± 10.4).

Conclusions: Flipped classroom and OSPE mode of learning can enhance and improve medical students’ interest in learning and their self-learning abilities. It is an effective teaching model that needs to be further studied and incorporated in medical school setting.

Keywords: Flipped classroom, OSPE, medical students, medical genetics.

1 INTRODUCTION

A laboratory practical is a platform for students to translate their knowledge into practice. Students may benefit in the learning of basic procedures to complement their conceptual basic understanding in science [1]. However, practical session was reported to be less effective in achieving its objective. Therefore, there must be an innovative way in conducting the practical session to suit the present millennial generation way of learning. Teaching and learning method has greatly evolved in the past decade, which includes the utilization of digital resources and interactive lectures. Many educators have implemented these prior to enhance theoretical understanding of laboratory practical in Science especially in Biology [2-5]. In addition, innovative way is preferred by the students as they can be well prepared before the practical session begins thus enabling them to perform better [6]. Therefore, the implementation of active learning is currently adopted in our medical program curricular. Our previous practical setting in Human Genetics module consists of introduction to different DNA tools to detect mutation in the laboratory without students being hands-on. We found students were disinterested in this type of teaching and thus we created a mini station-game-based learning incorporating the
objectives and learning issues of the practical. The structure of mini stations are based on the Objective Structured Performance Evaluation (OSPE), which has been implemented as one of the tool tests in the final examination for medical students. OSPE is introduced because it tests different desired components of students’ competence and eliminate examiner bias [7]. By adapting this concept, a minimum of 10 stations were created which cover the objective of elucidating the role of DNA technologies in determining mutation. This general objective is then translated into the following four specific aims:

1. to explain the principles of Polymerase Reaction Chain (PCR);
2. to explain the principles of mutation detection using PCR;
3. interpret DNA sequencing data for mutation detection;
4. to apply knowledge of mutation analysis to clinical diagnosis.

All four aims are taken into consideration to build task-based and game based questions in each mini station. Through this setting, the effectiveness of OSPE-based setting versus conventional practical in enhancing medical students’ knowledge in medical genetics topic in Biochemistry was evaluated.

2 METHODOLOGY

First-year medical students (n = 158) studying at University Kebangsaan Malaysia (UKM) Medical Center (UKMMC) during 2016/2017 session were selected to participate in this pilot study. “Mutation and Mutational Analysis” was the title chosen for the flipped learning session. This was previously a practical session conducted by the Department of Biochemistry, UKM MMC. Teaching materials were uploaded on UKMMC learning platform, iFolio™ a week before the session started. Students were given several videos which are pertinent to the topic that will be covered during OSPE. Students were required to watch the videos and read the laboratory practical book to learn step-by-step in determining the BRCA 1/2 mutation using DNA technologies such as DNA extraction, Southern blotting, and DNA sequencing. The OSPE session was divided into 10 small stations, which all were manned by a lecturer (content expert) and assisted by a medical laboratory technologist. Students were divided into small groups of 4 and they were given 10 minutes to complete the task in each station (Fig 1). Every station requires a team-work effort and compulsory questions must be answered before they can proceed to the subsequent station. Each task carries 10 marks which totals to 100 marks when all stations are completed. At the end of the session, students were given feedbacks on their performance by the head of medical genetics module. Their performance was subsequently assessed in the end of module examination and compared with the previous batch that learned the “Mutation and Mutational Analysis” by traditional practical method.

![OSPE diagram](image)

Fig 1: OSPE was conducted in 10 different stations
3 RESULTS

The average marks among 40 groups is 94.025% which is excellent (Table 1). We also assessed their knowledge of retention of what they had learnt through end of module examination (Fig 2), students were found to be better in answering on this topic (68.4 ± 11.6) as compared to students in the previous year who had only a conventional practical session (59.3 ± 10.4). When students were asked whether the session encouraged them to participate in a group discussion, 98.08% agreed with the statement whilst 100% agreed this session has encouraged them to think critically (Fig 3). Students also agreed that their understanding towards this topic is improved except one student (1.89%). A total of 96.23% of the students agreed the method of learning should be maintained in the future practical session. When students were asked if this interactive practical session is better than a conventional laboratory, 96.23% preferred the current implementation. In addition, they have also given their individual feedback, which are collated as below:

"It helps me to have a better understanding as we apply the information during the games (session). It also allows me to think critically."

"It helps to get deeper understanding on the selected topics"

"It makes me to become a critical thinker and understand better on the respective subtopics"

"It helps me to understand the process and principles of each genetic technique in a fun and exciting way."

"It makes me understand more clearly about the topics covered in the interactive lab session. I can remember easily the things I learned in this lab session."

"It helps me better in terms of applying it on a clinical case. I really like the interactive lab session a lot, to be honest."

"It was fun and at the same time, we could understand more"

"The gamification is very fun and challenging. It also develops the students' self-esteem"

"I think it empowers my understanding a lot and makes my misunderstanding clearer since we have to explain certain answers to the lecturers (content experts) and they are there to correct us."

"It helps me in understanding the subject more and learn more about things that I don't know."

"This session really helps me to understand the basic principle of the techniques and the method to carry out those techniques. The facilitators are good in explaining the mistakes that we made during the session which directly benefit us"

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<th>Table 1. Marks for 40 groups in OSPE-based practical</th>
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DISCUSSION

The assimilation of both technologies and flipped learning into laboratory practical can enhance its potential to benefit both students and educators. We have modified our laboratory practical in OSPE setting through multiple stations which allowed students to incorporate their understanding on concepts in Mutation and Mutational Analysis. This type of learning required students to perform a background reading regarding the topic through the materials given prior to the session. When students were grouped to complete the task in each station, they were able to share their prior knowledge as a team to achieve the structured answer. The presence of a content expert to validate their answer, made them to be more confident and learning was made fun and enjoyable. They felt satisfied with this type of learning as in case the answers they provided were wrong, the content expert will probe for further thinking. Even though each station has an allocation of 10 minutes, the tasks have been successfully completed and marks were given according to their achievement to complete the task. Their average mark is above 90 which suggests that through team-based learning, students can enhance their conceptual idea regarding the topic better. Similar implementation was seen in undergraduate pharmacology where they have found their students scored well in the application of the subject [8]. Whilst laboratory had been given a central and distinctive role in science education, and science educators have suggested that there are rich benefits in learning that accrue
from using laboratory activities [6]. Since Roth et al. [9] suggested that although laboratories have long been recognized for their potential to facilitate the learning of science concepts and skills, this potential has yet to be realized. It also has been emphasized that the principal focus of laboratory activities should not be limited to learning specific scientific methods or particular laboratory techniques; instead, students in the laboratory should use the methods and procedures of science to investigate phenomena, solve problems, and pursue inquiry and interests [10].

5 CONCLUSION

The implementation of OSPE-based in practical session was well received by the students. They were more active during the session, and enhanced their knowledge on mutational analysis better as was reflected in their end of module examination marks. This suggests that interactive and OSPE-based mode of learning in the practical innovation can maintain the quality of teaching and achieving learning outcomes.

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REFERENCES