Teaching Medical Ethics During Covid-19 Pandemic: An Experience Using Flipped Classroom and Game-Based Learning Running head: Online Flipped classroom and Kahoot

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Abstract

The COVID-19 pandemic has affected medical training worldwide. Many teaching and learning activities were replaced with online learning. The use of flipped classroom and game-based learning in teaching have been in trend recently. The objective of this report is to describe the students’ and teachers’ experience of using flipped classroom in combination with game-based learning and to explore their feedback on their use. This was a cross-sectional study where flipped classroom combined with scenario-based Kahoot! quiz was adopted during the synchronised online teaching of medical ethics for the second year undergraduate medical students. Based on their objective scoring and subjective feedback, almost all students agreed that the combination of flipped classroom and scenario-based Kahoot! quiz helped them understand the topics and achieve the learning outcomes. However, almost half of them were unsure whether they preferred the new methods over the traditional face-to-face lecture. Among the main problem for online learning was poor internet connection which interrupted their concentration and participation in class. As a conclusion, medical students were still sceptical whether flipped classroom and game-based learning were their preferred methods over the traditional face-to-face lecture. However, these combined methods were feasible to do during the pandemic and received good feedback from students. The main concern is the internet connection that may interrupt the running of the class.

Keywords: Flipped classroom, Game-based learning, Kahoot, Online learning, Medical students


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Introduction

Coronavirus disease 2019 (COVID-19) has spread rapidly out of China at the end of 2019 causing a pandemic crisis in the entire world. Malaysia has also been affected by the global pandemic. Malaysia reported the first case of COVID-19 on January 25, 2020, from a traveller from Wuhan, China \[1\]. Since then, a few Movement Control Orders (MCOs) have been imposed on Malaysians to control the infection. The MCOs have affected various activities in Malaysia including education. University students were gradually moved back to their homes for online learning. Many teaching and learning activities were replaced with online learning.

The COVID-19 pandemic has affected medical training in general. Since face-to-face teaching is reduced due to the risk of infection, many medical schools have replaced the training with an online method. This method is perceived by medical students to be less engaging, less enjoyable and majority feels difficult to learn clinical and practical skills through online teaching compared to face-to-face teaching \[2\].

Ahmed et al., (2020) showed that in the United Kingdom, the COVID-19 pandemic has affected medical students’ training \[3\]. This was due to frequent suspension of teaching and learning activities hence reducing medical students’ exposure which lead to poor exam performance. Physical distancing guideline makes it not possible for medical students and teachers to use face-to-face teaching methods \[4\]. This is especially during the pre-clinical years where the majority of teaching methods are through lectures where they are done in a lecture hall. Limitation of large space for proper distancing makes it impossible to be carried out using the face-to-face method. For clinical students, lack of personal protective equipment, cancellation of surgical procedures and appointments contributed to reduced exposure and clinical experience \[4\]. Unforeseen events such as this pandemic may have an implication to medical students. A study on the effect of modification in teaching methods after the Katrina hurricane in The United States showed that it had affected medical students’ performance \[5\]. Another study by Wilkinson et al., (2013) also showed that disruption in medical school following an earthquake had also affected medical students’ performance \[6\].

Teachers around the world have started to come up with many ideas on how to teach their students online. Fortunately, this pandemic occurs during the booming of the internet and the development of many applications and platforms that support education. Online learning has become popular even before the COVID-19 pandemic but becoming more so after the pandemic.

The main challenge of online learning is internet access. The coverage of internet access in Malaysia is only at 67\% \[7\]. Poor internet access affects the delivery of the class. Others include how to keep students focus during an online class and maintaining their enthusiasm and motivation to follow the class. Student-teacher interaction is also reduced due to either poor connectivity or delayed response by students due to technical issues such as switching on and off the audio and video. Poor connectivity may lead to teachers opting for switching off the video, hence further reduce the monitoring of student focus and interaction.

The use of flipped classroom (FC) and game-based learning (GBL) in teaching have been widely adopted among teachers from primary to tertiary education especially as online learning had become the dominant mode of learning currently. A flipped classroom is defined as “a new pedagogical method, which employs asynchronous video lectures and practice problems as homework, and active, group-based problem-solving activities in the classroom” \[8\]. It is a teaching method in which students learn about a topic at home, usually online, and later have discussions in class. It is a student-centred learning where the students can independently learn about the topic based on the materials given before a proper class with a teacher. The follow-up class is done to clarify students’ understanding, focus on the unclear subjects or issues and on students who have problems understanding the subjects. The advantage of a FC is it can save time on face-to-face teaching, encourage student-centred learning, a more flexible learning time, deeper learning and more quality learning time where the focus is on clarification and understanding of more difficult topics \[9\]. The FC also applies the use of technology-enhanced learning as well as strengthening the blended teaching method as proposed by Malaysian education blueprint 2013-2025 \[7\]. Its use also helps to achieve the learning outcomes of digital skills as outlined by the Malaysian Qualifications Framework version 2.0 \[10\]. Despite that FC is a new pedagogical approach, it has been increasingly accepted by the medical students\[11\]. Improvement in learning, increased satisfaction as well as examination performance have been shown in pre-clinical medical students compared to the traditional face-to-face lectures \[11,12\]. A systematic review on FC showed positive perceptions of the FC method although its effects on improvement and retention in knowledge were less conclusive \[13\].

Game-based learning in education is another emerging teaching method that has been introduced...
Recently, it gains popularity among students of the Z generations who are in the current medical students' age range. They are most familiar with digital devices and more engaged through social media. There are a few GBL platforms available online and free for use with some limited features. Kahoot!, Gimkit, Quizlet, Quizziz, and Socrative are using quiz-based features. Quiz-based features such as Kahoot! can be used for learning and assessment tools. Quiz-based features have been shown to increase student engagement, concentration, enjoyment, motivation to learn and the overall quality of teaching and learning. However, there are also disadvantages of online GBL. The problems were related to internet connectivity, pressure that leads to stress to students, problems with catching up with answers and some technical issues with the applications such as not being able to change answers.

Medical ethics is an essential subject for medical students as it is expected that medical professionals practice ethically up to an acceptable competency. However, the methods of teaching it are various with no standard consensus among medical schools on the best method to be used. In general, the previous methods of teaching have been acceptable to the students and lecturers, which are in the form of didactic lectures, group discussions or tutorials, role plays, student-centred seminars/project presentations, demonstrations, ward-based teaching and even debates. Teaching medical ethics to medical students is not an easy task as it has no hard and fast rules for certain concepts. To navigate the students’ ethical compass, it is important to use active learning strategies that allows optimisation of student engagement and encourage critical thinking in discussing the ethical issues.

At the faculty of Medicine, Universiti Sultan Zainal Abidin, Terengganu, Malaysia, the subject of medical ethics is taught throughout the programme from year one until year five. The subject is taught under the Personal and Professional Development Module. During the first two years, students are first introduced to the main principles of medical ethics and subsequently going into each of the principle. Prior to the COVID-19 pandemic, all teaching and learning activities for the medical programme were done face-to-face. Lecture was the most common teaching method used for the pre-clinical years (Year one and Year two) including the teaching of the theory of medical ethics. There were two topics taught in the second semester, which were 1) Principles of Medical Ethics 2) Confidentiality. The time allocated for both lectures was one hour. During the COVID-19 pandemic, all theory teaching sessions were done online.

Despite the challenge of having to teach this subject online and being sceptical of whether FC combined with GBL can teach the subject effectively, a trial of these teaching methods was done. The objective is therefore to look at the students’ feedback on FC and GBL namely Kahoot! as a substitute to face-to-face traditional lecture.

**Methods**

**Participants**

The participants were the second-year medical students at the Faculty of Medicine in Universiti Sultan Zainal Abidin for the session of 2020/2021. They were 60 students altogether. The participants were already familiar with Kahoot! applications as other lecturers had also been using the application in their face-to-face class previously.

**Teaching delivery**

During this COVID-19 pandemic period, the lecturers decided to use FC method followed by quiz during the synchronise online teaching for the two topics for medical ethics. These two classes were one week apart.

**Pre-class materials and instructions**

Students were provided with teaching materials about one week before class. For the ‘Principles of Medical Ethics’ topic (Lecture 1), students were provided with a 2-minute PowToon video on YouTube, and a 4-minute video lecture uploaded on YouTube. The 4-minute video lecture was PowerPoint slides from the normal face-to-face lecture that had been converted into a video form. For the ‘Confidentiality’ (Lecture 2) topic, students were provided with a Microsoft PowerPoint lecture presentation and additional resources provided in Padlet. Resources were reading materials such as guidelines by the Malaysia Medical Council and General Medical Council, United Kingdom. Topic learning outcomes were provided in the video lecture for Lecture 1 and the PowerPoint slides for Lecture 2. Students were briefed on the FC method and its expectations during the distribution of the material. Students were also informed that a quiz would be given during class using Kahoot! to assess their understanding and prize would be given to the winners. Prize (which were food snacks) were prepared to encourage their enthusiasm for learning and to participate in the quiz.

**In-class activities**

Synchronous online teaching was done using the Cisco Webex platform. During synchronous online teaching, the lecturer provided a short summary on the topic based on the materials given for about 15 minutes. The next 15 minutes were used for a question and answer session with the students, to clarify any queries and to confirm understanding.
The last half an hour was used for quiz using Kahoot! applications. For Lecture 1, eight quiz questions based on real scenarios (e.g. news clip) were used to represent each of the medical ethics principles which are Autonomy, Beneficence, Non-maleficence and Justice (2 scenarios for each). For Lecture 2, ten created clinical scenarios were used to reflect different possible issues in confidentiality. For these scenarios, students were tested mainly on their decision-making skills based on their understanding of the concepts. After each scenario, the lecturer discussed and justified the answer with the students. At the end of the Kahoot! session, winners of the quiz were announced. At the end of the class, the lecturer summarised again the concept and invited any final questions. The class ended after about one hour.

Post-class feedback
For both sessions, feedback on the class was done after the class session using an online Google Forms. For the quantitative feedback, students rated the questions in 5 Likert scales from ‘Strongly disagree’ (1 point) to ‘Strongly agree’ (5 points). The questions include their perception on FC (providing materials to students before class), scenario-based quiz, Kahoot! use, whether they prefer a traditional lecture and whether they have achieved the learning outcomes. Subjective feedback was also requested but it was optional.

Analysis of the results
Results were analysed descriptively in percentage and mean. Subjective feedback is presented in their original statement.

Results
About 73% of students responded to the feedback for Lecture 1 and 100% for Lecture 2. The demography of the students is as in Table 1. Majority of the participants were female and Malay.

Table 1: Demographics of the participants (n=60)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>22</td>
</tr>
<tr>
<td>Female</td>
<td>38</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>47</td>
</tr>
<tr>
<td>Indian</td>
<td>8</td>
</tr>
<tr>
<td>Chinese</td>
<td>5</td>
</tr>
</tbody>
</table>

The distribution of response based on the Likert scale is as shown in Table 2. All the questions had positive response from the participants except for the question on whether they preferred the traditional lecture where a high proportion of them were unsure of their preference. The subjective feedbacks from some of the participants are presented in Table 3. The subjective feedback was categorised into five major themes based on the main themes provided by students. The themes were also found to be the common issues that were faced by students from previous literature. The feedbacks were mostly positive. Participants also gave some recommendation to improve the class.

Discussion
This sharing of experience gives an overview of the feasibility and challenges on implementing a relatively new method of online learning during the pandemic in a medical programme. The main challenge was internet access. A prior survey on the participants’ internet access showed 66% had a wireless network at home. However, only about 40% had a stable connection. Of those who used internet data, about 54% did not have enough data for learning due to its cost. About 20% of the participants had to go to some other places to get a good network signal. Experience from this study showed that a few students had been in and out of the online classroom due to interruption of internet connectivity. This problem had affected their participation in the Kahoot! quiz and their attention on the online class. Another challenge to fully online learning is anxiety from the students as well as lecturers. They were sceptical as to whether full online learning would be effective. A study on medical students in Saudi Arabia showed that 41.8% of students and teachers had little experience with online learning before the pandemic. About 62.5% still preferred blended learning which is a combination of online and face-to-face learning. About 27.3% of medical students disagreed with the suggestion to shift teaching activities into an online method. An integrative review of barriers to online learning in medical education by Doherty et al had highlighted the key barriers to preparing online learning materials include poor technical skills and inadequate infrastructure. This includes not only poor internet access and coverage but also technical readiness from teacher as well as students. Therefore, the technical tips while preparing the materials for an online class such as video, slides presentation or other reading materials is that; they should be saved in as small file size as possible because it affects internet use. Therefore, the videos in this study (both PowToon and video) were prepared in a short duration (two minutes and four minutes). A smaller size video file may affect its resolution and quality of sharpness. Therefore, the text in the video should be reasonably large to be legible.
<table>
<thead>
<tr>
<th>Item</th>
<th>Lecture 1 n(%)</th>
<th>Lecture 2 n(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly agree</td>
<td>Agree</td>
</tr>
<tr>
<td>The materials prior to class help me understand the topic</td>
<td>(5)</td>
<td>(4)</td>
</tr>
<tr>
<td></td>
<td>39(79.6)</td>
<td>10(20.4)</td>
</tr>
<tr>
<td>The discussion based on the scenario help me understand the topic</td>
<td>35(71.4)</td>
<td>14(28.6)</td>
</tr>
<tr>
<td>I prefer the traditional lecture than the prior materials and quiz</td>
<td>5(10.2)</td>
<td>12(24.5)</td>
</tr>
<tr>
<td>I like the use of Kahoot! game in class</td>
<td>35(71.4)</td>
<td>14(28.6)</td>
</tr>
<tr>
<td>In general, I am able to achieve the learning outcomes using this teaching method</td>
<td>29(59.2)</td>
<td>20(40.8)</td>
</tr>
</tbody>
</table>
Table 3: Subjective feedback from some of the participants

<table>
<thead>
<tr>
<th>Theme</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-class materials</td>
<td>Giving slides earlier actually helps me a lot during the class because I can revise first. Even during the quick revision, I did not understand much, but at least I am familiar with the word and quick to catch up. Prior materials helped students to have a rough idea of what to be discussed in the class. It is easier for me to understand in class as I had already read the materials given before class. Provide additional resources which are relevant to the quiz questions. I highly agree with it as students can take a look at what they will learn before the actual session takes place.</td>
</tr>
<tr>
<td>Scenario-based quiz</td>
<td>I really love how the class was handled (the Kahoot and scenario-based cases). Because, even though we learn the theory, the application in our real-life situation is quite complicated and confusing. But, when it was put in scenarios, it helped us a lot in understanding what we read in the lecture slides. For scenario-based quiz and discussion, I found it very interesting and easy to understand as well as be able to correlate with the situation. It helped students understand more rather than just reading fact points in the lecture notes. The scenario-based quiz helped students to understand the topic better because it was testing the application of the theoretical concept that the students were taught. The discussion after each question was very helpful. The quiz and discussion during actual class was useful, as it requires student to think critically rather than memorizing facts.</td>
</tr>
<tr>
<td>Conduct of the class</td>
<td>Good session, active discussion. I feel like it's a fun and effective way to learn the topics because it's like active learning. The class was engaging. Conducting the class via Kahoot quiz was fun and energizing us to participate in the class. The Kahoot session was extremely nice, and very helpful to understand. I got the urge to prepare before join the Kahoot. After each question, lecturer explained first before proceeding which helped to understand more.</td>
</tr>
<tr>
<td>Internet connection</td>
<td>Internet connection was a problem which leads students not being able to participate fully in the Kahoot quiz. It was quite difficult to interact online especially when the internet connection was poor. My connection sometimes are not stable</td>
</tr>
<tr>
<td>Time</td>
<td>The drawback is, the quiz was time-consuming especially when the time allocated for each question was too long. The lecturer should have a better estimation of the time needed for each question. It takes too much time sometimes and some of us have problems with their internet connections so they can't enjoy it much.</td>
</tr>
</tbody>
</table>
Another reason why the video material should be short is because students’ attention fades as the duration of time increases. Shorter videos between five to ten minutes increased the chances for students to view the video compared to a longer video [23]. The students also found that the pre-class video was a good experience, increased chances for preparation and perceived it to be beneficial [23].

In FC, the authors also found that encouraging the students to go through the materials before class was a challenge. Students need to be reminded a few times to watch the videos and go through the slides (since the videos were uploaded on YouTube, the authors can monitor through the number of views). For both topics, students were found to be studying the materials only in the last one or two days. Similar issue was seen in a study by Yen (2020) among Tourism Management students at a university in China [24]. A study by Bordes et al., (2021) also showed that only 24.6% of the students spent at least 30 minute for the actual class [25]. About half of the students did not make any preparation at all. Chung Kwan Lo, in his review of FC, has outlined student-related challenges in participating effectively. They can be due to lack of familiarity with the teaching method and preferences with traditional classroom [25]. Other challenges include lack of out-of-class support as well as pre-class activities that are time consuming which are not the case in the study as the students are provided with e-learning portal and the instructional videos and lectures that were provided before class are short and require reasonable amount of internet usage only. Therefore, some measures that may reduce those barriers, may include briefing on the concept of FC with the emphasis on the importance of completion of pre-class activities, retaining a reasonable amount of workload before flipping the class and providing the students with communication platform outside the classroom using learning management system [25].

Teaching medical ethics using an online platform has been tried in medical students in Iran during the COVID-19 pandemic [26]. It was in the form of an online discussion with resources and case scenarios provided on their platforms. However, there was no synchronous online class with the presence of a lecturer. The qualitative findings showed that the students found it more convenient to access various resources at their own available time. They could also refer to the given resources when discussing the scenarios. The method was able to promote critical thinking and problem-solving skills. In contrast, there is a study in which students felt that communication with teachers was lacking and most questions were not able to be resolved through online teaching [27].

A study at a university in China showed that an online FC was feasible among their students [24]. Providing questions before the actual class further increased their knowledge in learning and deepened their understanding. When comparing FC with the traditional classroom, FC was shown to improve learning ability and knowledge as shown by increased exam score [24].

Despite that, all students give positive feedback on the use of Kahoot! during the teaching as demonstrated in the written feedback for the conduct of the class. The prizes for the winners might have attracted their interest in Kahoot! use. However, less students strongly agreed on its use in the second lecture. There were more Kahoot! questions in Lecture 2 and the questions were more difficult. This might give the impression that the use of Kahoot! may not be as effective compared to Lecture 1. Interestingly for Lecture 2, a more detail look at the results showed that 43(71.6%) of students gave the same response for both questions on ‘like the use of Kahoot’ and ‘able to achieve the learning outcomes’. In other words, for these students, if they answer ‘strongly agree’ for the use of Kahoot! they would also answer ‘strongly agree’ for achieving the learning outcomes. It seems to be consistent with the fact that game-based learning has been shown to improve students’ learning motivation leading to improved learning achievements [29,30].

The use of Kahoot! will also improve students’ attention in the actual class since attention wanes with time. In a study in China, results showed that 60.2% of their students were able to maintain their attention in class in the first 15 minutes but the proportion dropped significantly thereafter [27]. The attention became distracted completely after 25 minutes. The study also showed that by providing students with an online video prior to class followed by discussion in the formal class would improve students’ attention by 50%. Therefore, in the present study, Kahoot! quiz was started after about half an hour when students’ attention started to decline.

The authors also had the experience of using Kahoot! face-to-face before the pandemic. From personal experience, face to face Kahoot! session was more lively than the online version. This is because students can respond to each answer with cheering and applause. Interaction in between each quiz question was also prompt. The majority of students were engaged with the session. However, in an online Kahoot!, cheering, applause and engagement cannot be observed. The best response
that students can do was by showing an emoticon to show their emotions or responses.

Although this method of teaching was taken as a pilot test on using FC and online GBL in combination, the perception of students on the feedback questions was encouraging. The majority of students chose either ‘Strongly agree’ or ‘Agree’ for the positive questions. Except for the preference over the traditional lecture, the response was mixed. The results on whether the prior materials were helpful, the use of scenario-based discussion and the achievement of learning outcomes were similar for both lectures. About three-quarter of students found that the pre-class materials and scenario-based discussion were helpful.

About 20-30% of students preferred the traditional lecture over FC and Kahoot! About 40% of students were unsure. It was assumed that students were unsure to objectively say that they preferred this method since it was very new to them. In addition, their understanding of this topic had not been formally tested through a summative assessment. More importantly, it may be related to the different learning styles among students. Visual, auditory, reading/writing and kinaesthetic were known learning styles among learners [31]. The method used in these two lectures lacked auditory type (lecturer giving a lecture) and more of the reading/writing (slides, video) and visual (PowToon) types. The kinaesthetic learners were also disadvantaged especially when classes were done online where active participation was limited and physical presence was absent.

The subjective feedback from the students was also useful to improve FC and GBL. In general, the subjective feedback was positive especially on giving prior teaching materials and using scenario-based questions and discussion. It was consistent with their objective ratings. Internet was one of the main problems during online class and Kahoot! session. To improve the class, students suggested that the materials provided before class should be relevant to the content or questions discussed during the actual class. The allocation of time to answer each Kahoot! question should be reasonable so that students would not feel bored waiting for others to answer.

CONCLUSION AND RECOMMENDATION

Online teaching during the COVID-19 pandemic is challenging. Educators have come up with many creative ideas on how to make online learning works and effective. The use of flipped classroom in combination with game-based learning is feasible for teaching the theory of medical ethics in a medical programme. However, other elements should be included such as providing materials like a short video and quiz to increase their motivation to learn. Scenario-based quiz may be done either before or during class. Flipped classroom however may disadvantage some students who are auditory and kinaesthetic learners when the traditional face-to-face lecture is removed. Despite the attractiveness of any teaching model, the main issue of internet access should be resolved because it will affect the running of the online teaching delivery. Online learning, regardless of any methods and models chosen, should be planned carefully prior to implementation.

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