

Does Online Real-Time Quiz "Kahoot!" Increase Students' Knowledge and Enthusiasm During Laboratory Activity Lesson?

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Abstract Background: Teaching medical parasitology in the form of teacher-centered lectures requires innovation using the help of the latest digital technology to increase the effectiveness of the teaching. Realtime quiz Kahoot in an online platform is chosen in this study as a method combined with lecture because it is simple and flexible. Objective: This research analyzes the effect of applying Kahoot in increasing students' knowledge and enthusiasm for learning medical parasitology. Method: In total, 277 medical students were recruited to participate in this study, consisting of 181 females and 96 males. The research was a randomized controlled trial. The increase of knowledge was measured analytically using secondary data from pre-test and post-test during laboratory activity and the student's enthusiasm was described using primary data from questionnaires given to students that attend the Kahoot session. Participants are undergraduate medical students in Faculty of Medicine, Universitas Padjadjaran in the odd semester and divided into two groups: control and treatment. Results: There was no significant difference between the control group and the treatment group in knowledge increase, with a difference in median 0.055, confidence interval 95% (-0.126; 0.014), $p= 0.162$. The total average of the percentage of the participants scoring agrees statements in the primary data that showed student's enthusiasm was 68.85%. Conclusion: The analysis of

student's knowledge of medical parasitology after using Kahoot shows no significant difference reflecting that there was no effect in using Kahoot for increasing knowledge in the teaching-learning process. However, the descriptive analysis of questionnaires shows that student's enthusiasm was relatively high (68.65%) after using Kahoot in class.

Keywords Students' Enthusiasm, Kahoot, Teaching Method, Medical Parasitology, Education

1. Introduction

Research shows that lecture-based learning that is teacher-centered is now thought of as an ineffective method in transferring information and causing the listeners to become passive [1,2]. As the advancement of technology [3] progresses, the younger generation prefers and is accustomed to using technology as a helping tool in all aspects of their life, including studying [4]. Therefore, teachers must adapt to the changes that are happening. In realizing this, teachers can apply the latest education method based on technology to increase student's understanding of learning material [5,6].

In general, laboratory activity in medical school was

done by giving a manual to students and giving a lecture afterward [7]. Making the class to be more interactive can improve a teacher-centered class [8]. In recent years, there are several new methods used by educators in giving a lesson and one of them is by using online quiz and gamification [9] because it can increase student's enthusiasm [10]. Kahoot is used in the education process as a tool to give online quiz in the form of games (gamification) [11].

Kahoot is easy to be applied to educators or students [12,13], and it can be combined with lectures in order to increase student's participation, attention and wellbeing to the course given [12]. Enthusiasm is one factor that can increase effectivity in teaching-learning process. There is information retention to a person's memory by learning, which can increase his or her knowledge [14]. For these reasons, this research aimed to observe the effectiveness of using Kahoot in increasing knowledge and enthusiasm of students during teaching-learning process.

2. Materials and Methods

The design of the study is a randomized controlled trial. The research was conducted in the laboratory activity of Faculty of Medicine, Universitas Padjadjaran, Indonesia. It was performed during the Gastrointestinal System rotation with the topic of medical parasitology, in odd semester of 2019. The data used were secondary data obtained from pre-test and post-test during the lecture of medical parasitology and then these data were analyzed as knowledge variable. The student's enthusiasm toward the use of Kahoot was obtained from primary data through questionnaires.

The participants of this study were medical student undergraduates of Faculty of Medicine, Universitas Padjadjaran in the fifth semester. The inclusion criteria for knowledge measurement were the score of students who attended the medical parasitology laboratory activity. Scores of students who only took pre-test or post-test and took the Kahoot Session one time were excluded from the analysis. The analysis was conducted by comparing the pretest and posttest score of students that were treated with Kahoot game activity and students having no Kahoot session during their laboratory activity. On the other hand, the inclusion criteria for enthusiasm were students who attended the medical parasitology medic laboratory activity with Kahoot session and were willing to participate after giving informed consent. The scheme of inclusion and exclusion during the study can be seen in **Appendix figure 1**.

The number of participants was determined by total sampling. Participants were divided into six groups according to their lab activity schedule, which is Monday, Wednesday and Friday and on each day, there were 2 sessions, morning and afternoon. Randomization at the group level was done by the resource person during the

lab activity to determine the control group and the treatment group. Treatment group (I) was the group that received additional treatment, they did the pre-test using google forms, received lecture, used Kahoot and then did the post-test. Control group (II) was the group that did not do Kahoot and only took pre-test and post-test with a lecture in between. The randomization result was lab activity group on Monday morning, Friday morning and Friday afternoon was assigned as the control group and the group on Monday afternoon, Wednesday morning and Wednesday afternoon was assigned as the treatment group. In the end, the treatment group with Kahoot session was asked to fill in questionnaires after informed consent. The scheme of the research design can be seen in **Appendix figure 2**.

To measure the enthusiasm of students, questionnaires adapted from the research "The Wear Out Effect of A Game-Based Student Response System" (Alf Inge Wang, 2014) [15] were distributed to collect the data. The questionnaire consisted of 11 statements and was distributed using Google forms platform. Before the questionnaire was used, the questionnaire was tested for validity and reliability test among the students of the Faculty of Medicine, Universitas Padjadjaran.

The quiz for Kahoot session and online pre-test and post-test were made by the resource person of the medical parasitology laboratory activity.

Ethical clearance

This study was approved by the Ethics committee of Universitas Padjadjaran. (Number: 1087 / UN6.KEP / EC / 2019).

Data analysis

The collected data of pre-test and post-test score were analyzed using Wilcoxon Rank Sum test to compare the level of knowledge between groups of students who have Kahoot session (treatment group) with students who have no Kahoot session (control group). The students' enthusiasm was described from the questionnaires result. IBM SPSS software version 20 and R 3.6.1. were used to help the statistical analysis. All statistical tests were carried out at the significance level $p < 0.05$.

3. Results

From the statistical analysis, the results are as follows:

1. Kahoot game activity session during laboratory activity did not increase students' knowledge

The number of participants that meet the inclusion and exclusion criteria to analyze the knowledge variable was 277 students and was divided into 2 groups. The control group consisted of 136 students and the treatment group

consisted of 141 students.

It can be concluded from the statistical analysis that there was no significant difference between the score in both the treatment and the control group ($p = 0.162$). The data analysis of pre-test and post-test is shown in Figure 1.

2. Enthusiasm toward the use of Kahoot was high

As mentioned in the materials and methods section, to obtain students' feedback regarding their experience during Kahoot session, the questionnaires were given.

There were 24 students who were unwilling to fill the questionnaire in the treatment group and therefore the response rate from the descriptive analysis of the questionnaire was 82,9%.

Even though there was no significant difference between the score of the test, analysis of student's enthusiasm among 117 students toward the use of Kahoot showed a good level of enthusiasm. The result of the descriptive analysis of the agreement of the participants is shown in Table 1.

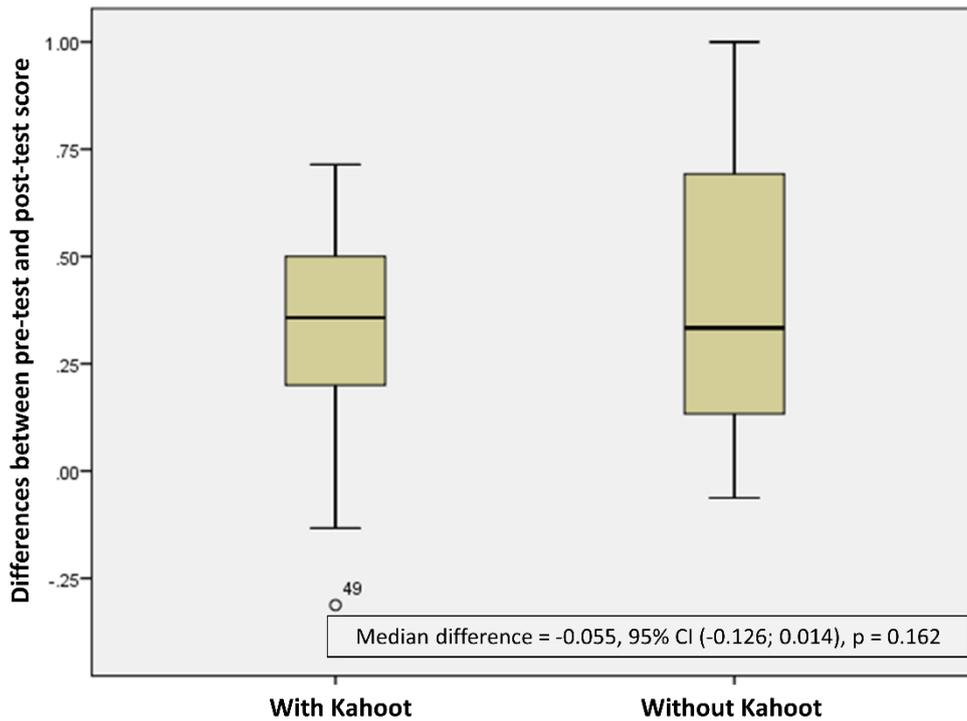


Figure 1. Statistical analysis of differences between students' pre-test and post-test score

Table 1. Questionnaire data analysis

No	Statement	Disagree	Neutral	Agree
1	I can easily use Kahoot with my cellular phone	1,72%	5,17%	93,10%
2	I interact with other players about the quiz material when Kahoot session has finished	4,31%	27,59%	68,10%
3	I enjoy competing with other players	10,34%	20,69%	68,97%
4	I enjoy playing Kahoot in the same room as the other players	3,45%	16,38%	80,17%
5	I concentrate more when playing with other people	12,93%	37,93%	49,14%
6	I am actively involved with the course material during Kahoot session	1,72%	29,31%	68,97%
7	I am emotionally involved to the game during Kahoot session	17,24%	40,52%	42,24%
8	I enjoy playing Kahoot	2,59%	17,24%	80,17%
9	I hope Kahoot can be used in other learning topic	6,90%	20,69%	72,41%
10	I understand better and I like the topic given after Kahoot session	7,76%	39,66%	52,59%
11	I learn something about the material given in Kahoot session	4,31%	16,38%	79,31%
	Total average	6,66%	24,69%	68,65%

a. User-friendliness in using Kahoot platform

The first statement in Table 1 (I can use a cellular phone to access Kahoot easily) was asked to evaluate the difficulty in using Kahoot platform in cellular phones. Overall, students felt it was easy to access Kahoot using their cellular phones with the score of agreement 93,10%.

b. The class dynamic was increased during Kahoot session

The class dynamic can be seen from the response to the second statement to the fifth statement about the interaction between students, enjoyment during the competition, enjoyment while playing in the same classroom, and the level of concentration during competing with other students. It can be concluded that the class dynamic was increased. The percentage of agreement in the second statement (I interact with other students about the quiz material when Kahoot session has finished) showed a score that was not relatively high, which was 68,10%. Several respondents did mention that they interacted with other students during the Kahoot session, when each question has been finished, and the score was shown.

The third statement (I enjoy competing with other players) showed a high frequency of agreement (69,87%). The majority of the respondents enjoy the competitive environment so that many of them felt motivated to get the highest score. However, there were also several respondents who did not enjoy this and felt pressured, especially when they were not able to answer the quiz. The fourth statement (I enjoy playing Kahoot in the same classroom with other students) reached a very high agreement percentage (80,17%). Respondents felt happy when they could see the other players' scores on the main screen.

In the fifth statement (I concentrate more when playing with other students), the agreement percentage was relatively low (49,14%). The feedback from the students mentioned that the reason why their concentration was not affected because the time to answer the quiz was relatively short.

c. Student's involvement in the course material

Statement 6 and 7 in Table 1 concerning the student's active participation. Statement 6 (I am actively involved with the course material during the Kahoot session) showed a relatively good percentage of agreement (68,97%). Meanwhile, statement 7 (I am involved emotionally to the game during the Kahoot session) showed an agreement percentage (42,4%) that is not very different from the neutral agreement percentage (40,52%) with the difference of 1,72%. From the students' feedback, they felt emotionally involved when the other players had higher scores than what they had, or when the students had a desire to put themselves in the top 5 ranks so that their name would be shown in the leaderboard. Several

students were neutral about the statement because they think Kahoot was just a game and they could accept if the scores were not as they expected.

d. Enjoyment in using Kahoot and the material given

Statement 8 to 11 in Table 1 were given in order to see how Kahoot influences student's motivation during giving material. The three statements showed a high percentage of agreement, especially statement 8 (I enjoy playing Kahoot) and statement 9 (I hope Kahoot can be used in other activity) with the agreed percentage of 80,1% and 72,41%, respectively. This is because players considered learning with Kahoot was not monotonous and hoped that Kahoot is used in certain materials, for example, material that was difficult and boring.

On the other hand, the agreement percentage to statement 10 (I understand better and like the topic that was given after the Kahoot session) only reach 52,59%. The low percentage of agreement to that statement was because students felt that the Kahoot session was not enough to make them feel more interested in a certain topic. Giving quiz through gamification needs to be supported with interesting lectures. The last statement, statement 11, mentioned if the students felt they had learned or gained something about the material that was given in the quiz during Kahoot session. The questionnaire showed 79,31% of the students agreed to the statement. The students felt that the material given became clearer to them because the main important points of the material were included in the quiz. The students can also recall the material beforehand because Kahoot session was allocated at the end of the medical parasitology lab activity before the end of the lecture. By recalling the material, there was a repetition which can improve the memory of students about the material given.

4. Discussion

Kahoot is an educational platform based on gamification that has been used by millions of people every month after it was launched in 2013. The advantage of Kahoot is that it is free, it can connect educators and students in a quiz format, discussion panel, and survey. Furthermore, the quiz maker can add videos, images, or even music and they can adjust the time given for each question. Furthermore, the students only need to access the Kahoot site without an obligation to download it in their cellular phones and the results are shown in the main screen and in each cellular phone [16].

According to research in neurobiology, there are several methods that can be done to maximize the result of an educational process, which is the knowledge gained [17]. Amongst them are: repetition, reward and reinforcement, active involvement and visualization. Repetition can reactivate the information stored in the brain and result in

memory reinforcement. If someone is excited and enjoys a learning process, the brain will give a reward signal [19] that will then reinforce or enhance memorization [20]. Visualization aspect will help the brain to elaborate a complex subject so that it will increase the effectivity of studying [19,21]. Active involvement is when someone can learn information based on the experience in presenting something directly, instead of just learning theory, will increase confidence or reflection of what needs to be improved [22]. These aspects can be seen in the use of Kahoot in lecture. Kahoot allocated at the end of medical parasitology lab activity allows students to repeat material before the session ends. Kahoot also gives reward to players in the top 5 ranks by showing the highest scores on the main screen. Reward in the form of compliment is often given by other players and teachers to the students with the highest scores. Kahoot provides interesting visualization by using many different colors and teachers can add images or videos in the quiz. These functions show that Kahoot is a suitable tool to be used as an additional session in lectures.

Based on the overall questionnaire results in Table 1, the total average of the agreement percentage is quite high, which is 68,65%. From this result, it can be concluded that the students' enthusiasm increased when they used Kahoot for learning. The level of knowledge of the students was also increased, whether the students were in the control group or in the treatment group. This result is in accordance with Oroujlu and Vahedi study which showed that students' enthusiasm, involvement, and willingness to participate will influence the quality of discussion and study so that it will increase the possibility of gaining knowledge [23].

This study has several limitations, one of them is that group randomization was only done at group level that was adjusted with the schedule of lab activity of each group. To increase the quality of the data, randomization can be performed at daily level or even at individual level

to get data with better quality. The participants of the research were limited only to students who attended lab activity with the topic of medical parasitology. It is suggested to increase the number of the study population in future studies, in other topics or other educational activities besides lab activity. The groups after the first lab activity (Monday morning) possibly had known the questions in the pre-test or post-test beforehand and it is better to use entirely new questions for different days or all evaluation is performed in the same time to reduce bias.

5. Conclusions

Kahoot application that is based on gamification is an optional method for learning and it is good to be used as a combination with the lecture in the educational process of the medical parasitology lab activity. This method is in line with the need for today, which is an implementation of the latest technology to education in order to increase effectiveness. From this study, it was shown that knowledge increase was not significantly different statistically, however, the students' enthusiasm after using Kahoot in lab activity was high.

Conflict of Interest

The authors declare that this research is not funded by any organization including Kahoot.

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Appendix

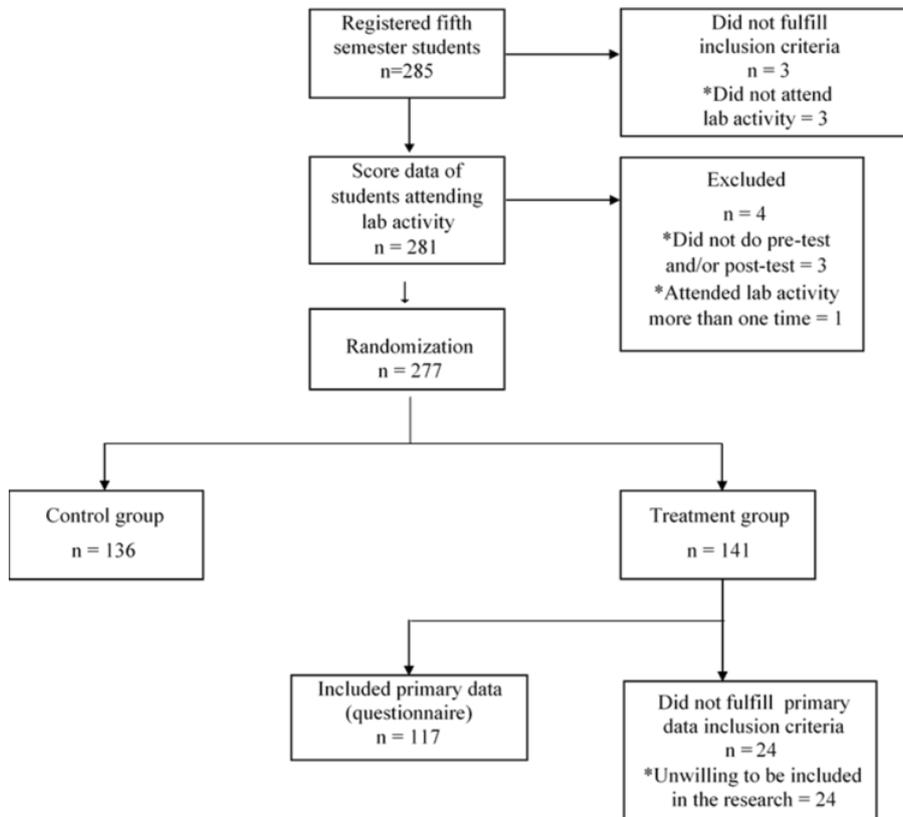


Figure 1. Schematic diagram of study design

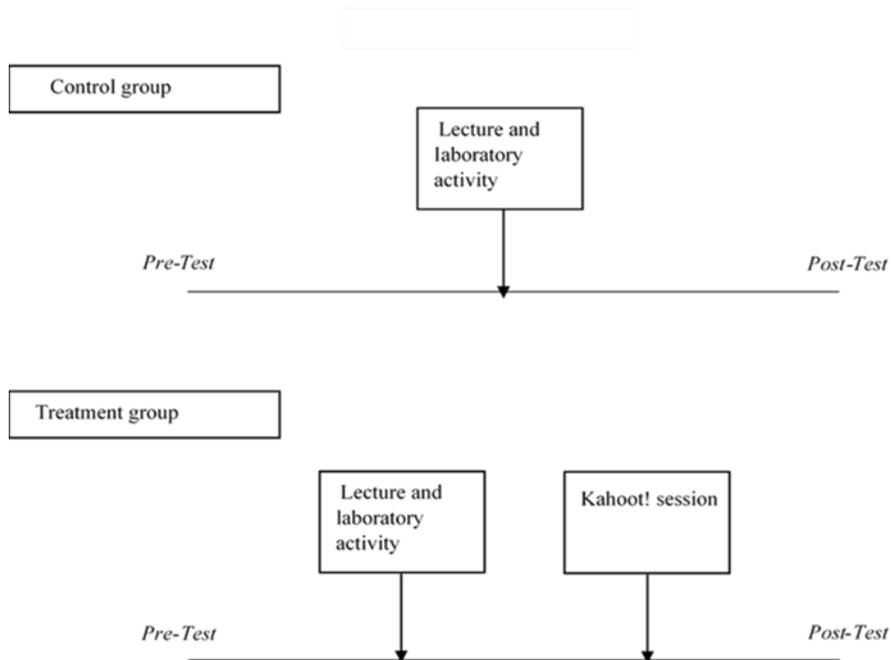


Figure 2. Schematic diagram of experimental setup

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