PHYSICAL EDUCATION OF STUDENTS

ORIGINAL ARTICLE

Lecture-based performance augmentation via game-based application *'Kahoot!'* in Physical Education: a 5-week experimental study

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Abstract

Background and Study Aim: Various published papers have already established the effectiveness of Kahoot! in bolstering students' academic performance through various games. However, there were few to no studies were conducted regarding its effectiveness in learning lecture-based concepts in Physical Education, most especially in the Higher Education setting. In this regard, this present study is aimed to assess the effectiveness of the said application via the Experimental approach.

Material and Methods: The respondents for the study are selected 2nd-year students from one section pursuing a Bachelor of Physical Education degree at City College of Angeles (Philippines). Participants were chosen via the Purposive Sampling Technique. 40 item test question covering the topics in Physical Education was formulated. The test question was used at the stage before the test and after the test. Furthermore, a questionnaire was used to assess students' perception concerning the attribute of Kahoot! The entire experiment lasted for 5-weeks. The experiment was conducted two weeks after the start of the 2nd semester (academic year 2021-2022). Descriptive analyses (frequency, mean, and standard deviation) were used to describe the perception of students based on the application's attributes. Paired t-test was utilized in order to assess the significant difference in the performance of students based on their pre-test and post-test scores.

Results: Based on the findings, students perceive all the attributes of the application to be 'very high' in terms of its accessibility (4.84 ± .22), enhancement factor (4.71 ± .27), motivational factor (4.65 ± .35), and objectives (4.78 ± .33). After the paired t-test analysis, a significant difference was observed between the scores of the students. The findings uncovered that students' post-test scores are significantly higher (32.44) compared to pre-test scores (19.56) with a mean difference of 12.88 ($p = .001$).

Conclusions: Kahoot! is an effective pedagogical tool to be used for teaching and learning lecture-based concepts in Physical education. Recommendations for teachers and future research directions were also presented as a result of this investigation.

Keywords: game-based application, higher education, Kahoot, performance augmentation, physical education

Introduction

Online learning as a modality has served its role and offered numerous advantages and benefits during the onslaught of the COVID-19 pandemic, where schools have been forced to close due to the rampant spread of the virus [1]. From the traditional face-to-face setting, students are required to enter their respective classes in a virtual classroom [2, 3]. One good thing about this modality is that it has been utilized by various Higher Education Institutions around the globe to facilitate students' erudition in the comfort of everyone's home. Indeed, even in this post-pandemic era, e-learning will still play a significant role in helping HEIs deliver quality education to students [4]. The advantages of utilizing this modality are flexibility, accessibility, and interaction between students and teachers [5]. Aside from other educational suites that were introduced, Kahoot! has been a pedagogical tool that is being utilized by teachers which increases knowledge retention through conducting summative or formative assessments via various games. This application is a free-student response tool for administering quizzes, facilitating discussions, and collecting data [6, 7]. It is a game-based classroom response system played in real-time [8, 9]. During and after the pandemic, numerous investigations were already conducted concerning e-learning and published scholarly works focusing on the effectiveness of Kahoot! as a pedagogical platform is still inadequate, most especially concerning its efficacy to learn lecture-based concepts in Physical Education in the sector of local colleges and universities (LCUs) setting in the Philippines. Scholarly works are predominantly vast in other countries, educational institutions, and various disciplines over the past years, during the assault of COVID-19, up until this post-pandemic

doi:10.15561/20755279.2023.0101

period [10, 11,12].

As mentioned earlier, e-learning will still play a significant role in aiding HEIs to deliver quality education to students. *Kahoot!* is still applicable even in this post-pandemic period, as there are still other HEIs globally that are still under a full-online learning modality. Likewise, in the current setting of this investigation. HEIs across the globe utilize *Kahoot!* because it is engaging, flexible, accessible, and can aid students to achieve academic feats. Such as the findings of Yürük [13], after the experimentation, it was discovered that the EFL pronunciation skills of the experimental group were developed by using the application. Moreover, *Kahoot!* was found to be effective as an alternative tool for teachers in teaching vocabulary and providing fun learning activities to students [6, 7, 14]. Furthermore, the study of Martín-Sómer et al. [15] revealed that due to the uncontrollable shift from face-to-face to online classes, the interest of students decreased which *Kahoot!* was found to mitigate it. Based on the findings above, it can be postulated that the said application is highly effective in engaging students through a game-based platform which can result in higher academic performance. However, the shreds of evidence that were displayed are not related to Physical Education. Thus, it can be construed that there is an empirical gap concerning published papers on the effectiveness of the platform in learning lecture-based concepts in Physical Education and an investigation should be conducted. In line with the need to conduct research, the present study is focused on determining the effectiveness of using a game-based application, such as *Kahoot!,* in enhancing the performance of students in lecture-based topics in Physical Education. The 21st century learners are more engaged in activities, especially in the post-pandemic period in Higher Education where most teachers meet their students virtually, and they are more active in lessons if they are introduced to various tasks under time pressure. Furthermore, 21st century learners should have the capacity to critically think and solve problems that may happen in their everyday lives. Currently, 21st century society is continuously evolving, thus, students must have the ability to become lifelong learners adapting to the changes and succeed in modern society.

This present investigation has used experimental design to determine the effectiveness of *Kahoot!* on the performance of undergraduate students in various lecture-based courses in Physical Education.

Materials and Methods

Participants

The study's selected participants are 2nd-year undergraduate students from 1 section comprises of 32 students currently enrolled in the Bachelor of Physical Education program at City College of Angeles, located in Angeles City (Philippines). Participants were chosen via the *Purposive Sampling Technique*. It is a non-parametric sampling strategy where the researcher can choose the participants for the study due to the qualities that are deemed fit [16, 17]. Table 1 illustrates the demographic characteristics of the participants for the study with respect to gender [N_{Male}= 20 (62.5%), N_{Female}= 12 (37.5%)] and age [$N_{19yrs\ old}$= 7 (21.87%) $N_{20yrs\ old}$= 13 (40.63%), $N_{21yrs\ old}$= 7 (21.87%), $N_{22yrs\ old}$= 5 (15.63%)].

Table 1. Demographic characteristics

Variable	Item	N(%)
Gender		
	Male	20(62.5%)
	Female	12(37.5%)
Age		
	19yrs old	7(21.87%)
	20yrs old	13(40.63%)
	21yrs old	7(21.87%)
	22yrs old	5(15.63%)

Ethical considerations

The respondents were required to provide their consent by agreeing to the statement attached in the Google Forms. Additionally, respondents were advised about the objectives of the study, its instruments, and the variables being measured for the study. Minor risks answering the online survey were also enumerated. Respondents are free to withdraw or to ask for debriefing anytime.

Study design

Instrument

40 item test questions covering the topics in Physical Education was formulated by the researcher. The constructed test items were used for the pre-test and post-test phases. Furthermore, the researcher has formulated a questionnaire to describe the perception of students on the attribute of *Kahoot!* with 5 statements per indicator: accessibility, enhancement, motivational factor, and objectives. The interpretation for each corresponding value of obtained data was recorded via a 5-point Likert scale. Lastly, the scale was validated by highly professional individuals aligned in the discipline. Table 2 illustrates the per-item response and overall mean interpretation used for the experiment.

Procedure

40 item test was used for the pre-test and post-test phases using Google forms. Each week, students use *Kahoot!* during the online class before the start of the discussion. After the discussion, the said application was also utilized during students'

asynchronous class, wherein a code was sent to students so that they could answer the review questions provided as long as they had an internet connection. After the intervention, the post-test was introduced to students, which is analogous to the questions used in the pre-test phase to determine the effectiveness of *Kahoot!* as a program that can increase students' performance. Finally, after the post-test, undergraduate students were asked to answer the questionnaire concerning their perception of the application in terms of its accessibility, enhancement factor, motivational factor, and objectives. The experiment lasted for 5-weeks which started after 2 weeks from the start of the semester last 2nd Semester, Academic Year 2021-2022.

Table 2. Descriptive interpretation

Range	Interpretation	Scale	Performance/ Remarks
4.20 – 5.00	Very high	33-40	Very good
3.40 – 4.19	High	25-32	Good
2.60 – 3.39	Moderately high	17-24	Average
1.80 – 2.59	Low	9-16	Below average
1.00 – 1.79	Very low	0-8	Poor

Statistical Analysis

In order to describe the level of perception of students concerning the attributes of the game-based application, descriptive statistical analyses were used such as Frequency, Mean, and Standard deviation. Finally, in order to determine the difference between the engagement and performance of undergraduate students in lecture-based courses in Physical Education, *Paired t-test* was utilized. This specific test compares the mean of two matched groups of people, examined at two different points in time [18].

Results

Table 3 typifies the overall perception of students toward *Kahoot!* concerning its *accessibility, enhancement factor, motivational factor*, and *objectives*. Based on its *accessibility*, the findings displayed that students perceive the application as a highly manageable and user-friendly platform that can be used in learning lecture-based concepts in Physical Education (4.84 ± .22), which yielded "very high." Additionally, students perceived the application's *enhancement factor* high due to its capacity to aid their learning skills by providing a learning environment they can enjoy due to *Kahoot!'s* game-based nature (4.71 ± .27), which the result exhibited as "very high." Moreover, based on the application's *motivational factor*, the result illustrated that students perceive *Kahoot!* to boost their motivation towards learning lecture-based concepts in Physical Education (4.65 ± .35), which yielded "very high." Lastly, with respect to the application's *objectives*, it was found that the application aids them in attaining the goals and objectives of the topic being presented by their teacher (4.78 ± .33), in which the result illustrated "very high." Across all indicators of the application's attribute, it can be postulated that students perceive *Kahoot!* as an effective tool for learning various concepts in Physical Education through various games that can stimulate learning, motivation, and engagement, which may result in highly competitive and performing individuals.

Table 3. Students' Perception on the attributes of Kahoot! - overall mean across indicators

Indicator	Mean ± SD	Interpretation
Accessibility	4.84 ± .22	VH
Enhancement Factor	4.71 ± .27	VH
Motivational Factor	4.65 ± .35	VH
Objectives	4.78 ± .33	VH

Note: Values are expressed as means ± standard deviation; VH- Very high, H- High, MH- Moderately high, L- Low, VL- Very low.

Table 4 and 5 unravels the students' performance based on their pre-test and post-test scores, and the paired t-test analysis findings. Based on the findings, before the students used *Kahoot!*, their pre-test scores garnered an "average" score and interpretation (19.56 ± 5.77), which is far different from their post-test results after using the said game-based application (32.44 ± 4.63) which yielded a score and interpretation of "very good." Based on the aforementioned results above, it can be posited that there is an observed variance based on the students' scores ($p < .001$) with a mean difference of 12.88. The approach that was used by the researcher is highly applicable to this present investigation as post-test is a standardized assessment which can be performed after the experimental phase to evaluate what students already know, comparing it to what they have learned during the process. Grounded by the findings, it can be postulated that *Kahoot!* makes a difference on the learning performance of students because of its nature of bolstering erudition through various games.

Discussion

Since the study is highly novel due to the scarcity of papers published on the application of the said game-based platform in teaching lecture-based concepts in Physical Education, moreover, in the Higher Education context in the Philippines. Also, the findings of this study are highly noteworthy to consider when utilizing *Kahoot!* as an application to maximize students' learning experience. Focusing

on the findings that were presented, it can be speculated that the said game-based platform is highly accessible due to its flexibility as it can be used by students anytime and anywhere through the use of a mobile phone or laptop/computer, which has supported by various previously conducted studies [6, 19, 20].

Table 4. Students' performance in the pre-test and post-test

Score	Pre-test	Post-test
	f (%)	f (%)
33-40	0(0.00%)	18(56.25%)
25-32	10(31.25%)	13(40.63%)
17-24	11(34.38%)	1(3.13%)
9-16	11(34.38%)	0(0.00%)
0-8	0(0.00%)	0(0.00%)
	19.56 ± 5.77	32.44 ± 4.63
	Average	Very good

Table 5. Pre-test and post-test difference after Paired t-test analysis

Tests	Mean	Mean difference	t-value	p-value
Pre-test	19.56	12.88	14.734	.001
Post-test	32.44			

This means that as long as students have an internet connection, they can easily access the application with ease that they can use to learn various concepts in Physical Education. Easy access is one of the most critical attributes a system or application should possess, as it will enable users to feel the effortlessness of utilizing and providing the opportunity to learn and enjoy the application. Additionally, the said game-based application's usability could enhance students' skills by allowing them to think systematically and fast whereas improving their memory capacity, which echoed the findings of other scholars [21, 22]. It can be postulated that *Kahoot!* may be used as a learning platform via games that offer enjoyment yet challenging tasks that can strengthen their cognitive abilities. Also, the findings exhibited that the game-based application may help students to quickly learn various concepts better because it gauges their motivation and engagement in class. Incorporating games or gaming methods affects intrinsic motivational factors, giving them a sense of achievement in aiming for the next level or completing a specific task. Due to the application's game-based nature, transforming a lesson perceived by students as daunting and mundane into a form of game may enhance students' achievement via academic reinforcement [10]. Moreover, the result may be hypothesized that *Kahoot!* helped them attain the lesson's learning objectives through mastery of the topic using games highly supported by previously conducted studies [21, 22, 23, 24]. As Graham MA et al. [25] have stated, a lesson's objectives vividly identify what teachers want their students to attain by the end of the lesson, while success criteria specify how students should demonstrate the concepts they received. In line with this, the findings can be hypothesized that *Kahoot!* may aid and guide both teachers and students to attain the goals of the topic by utilizing the said game-based application. However, not all topics in Physical Education may be aided by a game-based approach. Hence, teachers should carefully plan the demonstration of topics being introduced to students. On the one hand, the aforementioned supporting studies above are based on various disciplines and are not connected to Physical Education. Ergo, this study highly suggests conducting a similar study to other set of samples in relation to Physical Education to support or repudiate the claims of this investigation.

Furthermore, after performing paired t-test analysis, it can be concluded that after using *Kahoot!*, students' scores increased which can be seen on the results, which is analogous to other scholar's discoveries on their experimentations [26, 27]. However, this finding is not yet conclusive are there are no studies yet that were performed in relation to its effectiveness for students learning lecture-based concepts in Physical Education. In line with this, the present study highly suggests performing another experimentation to other set of samples involved in various Physical Education courses which can be used to support or repudiate the claims of this investigation.

Conclusions

This present study is focused on determining the effectiveness of the game-based *Kahoot!* application in the performance of a sample of Bachelor of Physical Education undergraduate students at City College of Angeles, Philippines through games. Based on the findings, after 5-weeks of experimentation, the results displayed that *Kahoot!* is an effective pedagogical tool to be used in teaching lecture-based concepts in Physical Education. In this, it can be concluded that the said game-based application can be used to foster enjoyment bolstering their critical thinking skills under time pressure, motivation and engagement which may result to highly performing students. Moreover, due to its accessibility, *Kahoot!* can be easily navigated due to its user-friendliness, and it can be used by those who are using mobile phone or computer. In line with this, to maximize the usability of *Kahoot!*, most especially for Physical Education teachers, the study highly suggest that the college administration may provide in-depth training on how to capitalize the advantages of

the application. Therefore, policymakers and practitioners should provide interventions to boost instructors' familiarity with the platform, which may greatly help their professional careers, and will benefit students the most.

Most importantly, this study has drawbacks which readers and other researchers should take into consideration. This study is only limited to samples of BPEd students which does not generalize the entire studentry of the college or even other Higher Education Institutions (HEIs) in the Philippines, most especially those belonging from the Private Higher Education Institutions (PHEIs), State Universities and Colleges (SUCs) and other Vocational schools. In this regard, future researchers may find curiosity in conducting a similar study by collecting data from the abovementioned sectors and determining if the findings may support or refute the claims of this investigation. To conclude, this study provides new information in the existing literature on the effectiveness of *Kahoot!*, and filling the gap due to scarcity of papers published concerning its usability in Physical Education in the Higher Education.

Acknowledgement

The author would like to reach out his sincerest gratitude to all the students who participate for the study. Moreover, huge thanks to the ever supportive Vice-President for Academic Affairs, Dr. Carol A. Sarmiento, Dean of the Institute of Education, Arts, and Sciences, Dean Levita P. De Guzman, and the Vice President for Research, Extension and Quality Assurance, Dr. Jean Paolo G. Lacap.

Conflict of interest

The author declares no conflict of interest.

References

1. Lobo J. A sudden shift: Students' perception of distance and online education in physical education amidst COVID-19 Pandemic. *Edu Sport Indones J Phys Educ*. 2022;3(3):200–16. https://doi.org/10.25299/es:ijope.2021.vol3(3).9276
2. Lobo J, Dimalanta G, Bautista C, Buan E, De Dios D Al. TikTok Consumption and Level of Class Engagement of Performing Arts Students in the New Normal: Destructive or Beneficial? *Am J Educ Technol*. 2022;1(1):1–9. https://doi.org/10.54536/ajet.v1i1.305
3. Salasac C, Lobo J. Rising Popularity of TikTok During the Pandemic: Utilization of the Application Vis-À-Vis Students' Engagement. *Am J Interdiscip Res Innov*. 2022;1(2):43–8. https://doi.org/10.54536/ajiri.v1i2.699
4. Pokhrel S, Chhetri R. A Literature Review on Impact of COVID-19 Pandemic on Teaching and Learning. *High Educ Futur*. 2021;8(1):133–41. http://doi.org/10.1177/2347631120983481
5. Almahasees Z, Mohsen K, Amin MO. Faculty's and Students' Perceptions of Online Learning During COVID-19. *Front Educ*. 2021;6(May):1–10. https://doi.org/10.3389/feduc.2021.638470
6. Wang AI, Tahir R. The effect of using Kahoot! for learning – A literature review. *Comput Educ*. 2020 ;149(May 2019):103818. https://doi.org/10.1016/j.compedu.2020.103818
7. Elkhamisy FAA, Wassef RM. Innovating pathology learning via Kahoot! game-based tool: a quantitative study of students` perceptions and academic performance. *Alexandria J Med*. 2021;57(1):215–23. https://doi.org/10.1080/20905068.2021.1954413
8. Owen HE, Licorish SA. Game-Based Student Response System: The Effectiveness of Kahoot! on Junior and Senior Information Science Students' Learning. *J Inf Technol Educ Res*. 2020;19(June):511–53. https://doi.org/10.28945/4608
9. Wang AI. The wear out effect of a game-based student response system. *Comput Educ*. 2015;82:217–27. https://doi.org/10.1016/j.compedu.2014.11.004
10. Jones SM, Katyal P, Xie X, Nicolas MP, Leung EM, Noland DM, et al. A 'KAHOOT!' Approach: The Effectiveness of Game-Based Learning for an Advanced Placement Biology Class. *Simul Gaming*. 2019;50(6):832–47. https://doi.org/10.1177/1046878119882048
11. Figuccio MJ, Johnston M. Kahoot! Predicts exam scores and promotes student engagement. *J Res Innov Teach Learn*. 2022;15(2):170–7. https://doi.org/10.1108/JRIT-07-2021-0051
12. Martínez-Jiménez R, Pedrosa-Ortega C, Licerán-Gutiérrez A, Ruiz-Jiménez MC, García-Martí E. Kahoot! as a Tool to Improve Student Academic Performance in Business Management Subjects. *Sustainability*. 2021;13(5):2969. https://doi.org/10.3390/su13052969
13. Yürük N. Using Kahoot as a skill improvement technique in pronunciation. *J Lang Linguist Stud*. 2020;16(1):137–53. https://doi.org/10.17263/jlls.712669
14. Hadijah H, Pratolo BW, Rondiyah R. Interactive game "Kahoot!" as the media of students' vocabulary assessment. *J English as a Foreign Lang*. 2020;10(1):87–105. http://doi.org/10.23971/jefl.v10i1.1670
15. Martín-Sómer M, Moreira J, Casado C. Use of Kahoot! to keep students' motivation during online classes in the lockdown period caused by Covid 19. *Educ Chem Eng*. 2021;36(June):154–9. https://doi.org/10.1016/j.ece.2021.05.005
16. Lobo JT. The Relationship of Leadership Style to Commitment: Choreographers and Student Dancers' Perspective. *Int J Educ Leadersh Manag*. 2022;11(2). https://doi.org/10.17583/ijelm.10397
17. Lobo J. Virtual physical education: Google Meet as an alternative platform for learning skill-based concepts. *Phys Educ Students*. 2022;26(6):296–307.

https://doi.org/10.15561/20755279.2022.0604
18. Ross A, Willson VL. Paired Samples T-Test. *In: Basic and Advanced Statistical Tests*. Rotterdam: SensePublishers; 2017. P. 17–9. https://doi.org/10.1007/978-94-6351-086-8_4
19. Acosta-Vargas P, Acosta T, Lujan-Mora S. Challenges to Assess Accessibility in Higher Education Websites: A Comparative Study of Latin America Universities. *IEEE Access*. 2018;6:36500–8. https://doi.org/10.1109/ACCESS.2018.2848978
20. Licorish SA, Owen HE, Daniel B, George JL. Students' perception of Kahoot!'s influence on teaching and learning. *Res Pract Technol Enhanc Learn*. 2018;13(1):9. https://doi.org/10.1186/s41039-018-0078-8
21. Rojabi AR, Setiawan S, Munir A, Purwati O, Safriyani R, Hayuningtyas N, et al. Kahoot, is it fun or unfun? Gamifying vocabulary learning to boost exam scores, engagement, and motivation. *Front Educ*. 2022;7(September):1–11. https://doi.org/10.3389/feduc.2022.939884
22. Toma F, Diaconu DC, Popescu CM. The Use of the Kahoot! Learning Platform as a Type of Formative Assessment in the Context of Pre-University Education during the COVID-19 Pandemic Period. *Educ Sci*. 2021;11(10):649. https://doi.org/10.3390/educsci11100649
23. Kalleny N. Advantages of Kahoot! Game.based Formative Assessments along with Methods of Its Use and Application during the COVID-19 Pandemic in Various Live Learning Sessions. *J Microsc Ultrastruct*. 2020;8(4):175. https://doi.org/10.4103/JMAU.JMAU_61_20
24. Mdlalose N, Ramaila S, Ramnarain U. Using Kahoot! As A Formative Assessment Tool in Science Teacher Education. *Int J High Educ*. 2021;11(2):43. https://doi.org/10.5430/ijhe.v11n2p43
25. Graham MA, Staden S van, Dzamesi PD. Communicating Lesson Objectives and Effective Questioning in the Mathematics Classroom: The Ghanaian Junior High School Experience. *Int J Instr*. 2021;14(4):965–84. https://doi.org/10.29333/iji.2021.14455a
26. Tóth Á, Lógó P, Lógó E. The Effect of the Kahoot Quiz on the Student's Results in the Exam. *Period Polytech Soc Manag Sci*. 2019;27(2):173–9. https://doi.org/10.3311/PPso.12464
27. Taitano EJ, Vuong K. Analyzing the efficacy of the Testing effect of using KahootTM on Student Performance. *Turkish Online J Distance Educ*. 2017;18(2):80–80. https://doi.org/10.17718/tojde.306561

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Cite this article as:
Lobo J. Lecture-based performance augmentation via game-based application 'Kahoot!' in Physical Education: a 5-week experimental study. *Physical Education of Students,* 2023;27(1):4–9. https://doi.org/10.15561/20755279.2023.0101

Received: 20.11.2022

Accepted: 10.01.2023; **Published**: 28.02.2023