Asian Journal of Social Science and Management Technology
ISSN: 2313-74
Volume 7, Issue 1, January-February, 2025
Available at www.ajssmt.com

Harnessing Kahoot! For Digital Physics Assessments: Enhancing Engagement and Learning Outcomes in Prospective Teacher Education

Nurlina[1], Dewi Hikmah Marisda[2], Ratna Prabawati[3], Sirojuddin[3],

[1], Postgraduate Education Science, Muhammadiyah University of Makassar, Indonesia.
[2], Department of Physics Education, Faculty of Teacher Training and Education, Muhammadiyah University of Makassar, Indonesia.
[3], Department of Biology, Faculty of Teacher Training and Education, Muhammadiyah University of Education Sorong, Indonesia.

ABSTRACT : Lectures at the tertiary level utilize developments in technology and information through learning, one of which is assessment. Digital-based assessment in basic physics lectures is an important step towards modernizing education that provides ease and efficiency of use. This research is collaborative research at Muhammadiyah University in Indonesia, which uses a type of development research that refers to the Thiagarajan 4D development model, which consists of define, design, development, and dissemination stages. Research dissemination was carried out at two Muhammadiyah Universities in Eastern Indonesia, with the design of providing a pretest and posttest for the two research subjects. The application used is Kahoot. The format of the questions given is multiple choice and true-false, with a total of 60 numbers. The validation used is an expert validation method using the Content Validity Index (CVI), with a validation value of 0.85 and is declared valid. The instrument effectiveness test produced an N-Gain value for Campus A of 0.46 (medium) and Campus B of 0.55 (medium). Researchers recommend further development of Kahoot-based digital assessments to better suit student needs. In addition, additional research should be developed by paying attention to developing students' critical thinking and collaboration skills.

Keywords - Basic Physics, Digital Assessment, Kahoot, Research and Development

---

1. INTRODUCTION

Advances in technology and information have an impact on ease of communication and a positive impact on education, especially learning (Thomassen et al., 2020). Technology rapidly developed in learning during the Corona Virus Disease (COVID)-19 pandemic. At that time, the entire learning process used technology (Ma'Ruf et al., 2019), such as face-to-face meetings becoming virtual face-to-face with the Zoom Meeting and Google Meeting applications (R. Zhang et al., 2022) and attendance using the SIMAK or LMS application owned by each university (Klein et al., 2021). However, most assessments are still manual (Chen et al., 2021). Essential Physics is mandatory for Biology Education students at Muhammadiyah A College. Students must take the Basic Physics course in the first semester with a weight of three lecture credits. Likewise, in the Physics Education Study Program at College B, Basic Physics is a mandatory subject with a credit load of 3 credits (Ma'ruf et al., 2024).

The assessment process for Basic Physics lectures at Muhammadiyah University A still uses manual assessment to evaluate Basic Physics lectures. Students independently write answers on paper and manually circle the answers they consider appropriate and have not been structured (Resta et al., 2020). So far, assessment is still considered boring (Nielsen et al., 2020) and frightening for students (Langenfeld et al., 2022). This is a challenge for lecturers in managing and implementing innovative and enjoyable lectures (Marisda et al., 2023). One of the digital applications that is currently viral is Kahoot (Dhawan, 2020; Gao et al., 2020). Kahoot is a game-based digital learning platform (Arlinwibowo et al., 2023) that makes it easy to create, share and play learning games (Wang & Tahir, 2020; Q. Zhang & Yu, 2021). Kahoot also accommodates the provision of images (Baszuk & Heath, 2020) and tables appropriate to the abstract content of the Basic Physics course. In terms of use, Kahoot is user-friendly (alsswey & Malak, 2024) both on student smartphones and laptops (Suharsono, 2020). With Kahoot's convenience and innovative features, problems experienced by students and lecturers in the lecture process assessment can be overcome.

Based on the results of the research team's initial observations of Basic Physics lectures in the Biology Education Study Program at Muhammadiyah University A, information was obtained that most learning assessments still took place manually using the description question type in both the Mid-Semester Examination and Final Semester Examination, while in the Physics Education Study Program at Muhammadiyah University B has used the Kahoot assessment application in Basic Physics lectures on a limited basis on several lecture topics. Muhammadiyah University A and Muhammadiyah University B have a smooth internet connection to access digital learning applications. Muhammadiyah University B suggested that Muhammadiyah University A use the Kahoot assessment application among other learning assessment application options. The Kahoot application was chosen because it has several advantages, including questions containing images, tables, graphs, and short animations. Apart from that, the advantage of Kahoot is that it is user-friendly and can be used on smartphones or laptops (Martín-Sómer et al., 2024). Another advantage is that Kahoot can be accessed with a lighter internet quota than other digital assessment applications (Cadet, 2023).

Assessment of Basic Physics lectures using digital applications at Muhammadiyah University B has already been used, namely with the University's LMS SPADA application. However, it is limited to collecting student assignments. Some students need help using the application on their smartphones. Therefore, only some lecturers use SPADA LMS in their lectures. Other research related to the Kahoot digital application has also been used in the Physics Education Study Program at Muhammadiyah University B in 2022 but is limited to several lecture topics (Nurlina et al., 2022).

Meanwhile, partner universities, namely Muhammadiyah University A, have never implemented digital learning. Therefore, the novelty of this research is the use of an assessment application in Basic Physics lectures that can be used by prospective Physics teachers and Biology teacher candidates at Muhammadiyah University A. Another novelty offered in this research is the varied questions developed in a Kahoot-based assessment instrument, namely multiple-choice and true-false questions. Apart from that, the application being developed will add rewards and motivation for students in the form of funny animations when students answer questions correctly and different funny emoticons if they answer incorrectly.

2. METHODS

This is development research, which refers to the Thiagarajan 4D development model. Thiagarajan's 4D development model consists of stages: define, design, develop, and disseminate. Detailed research stages can be seen in Figure 1 below.

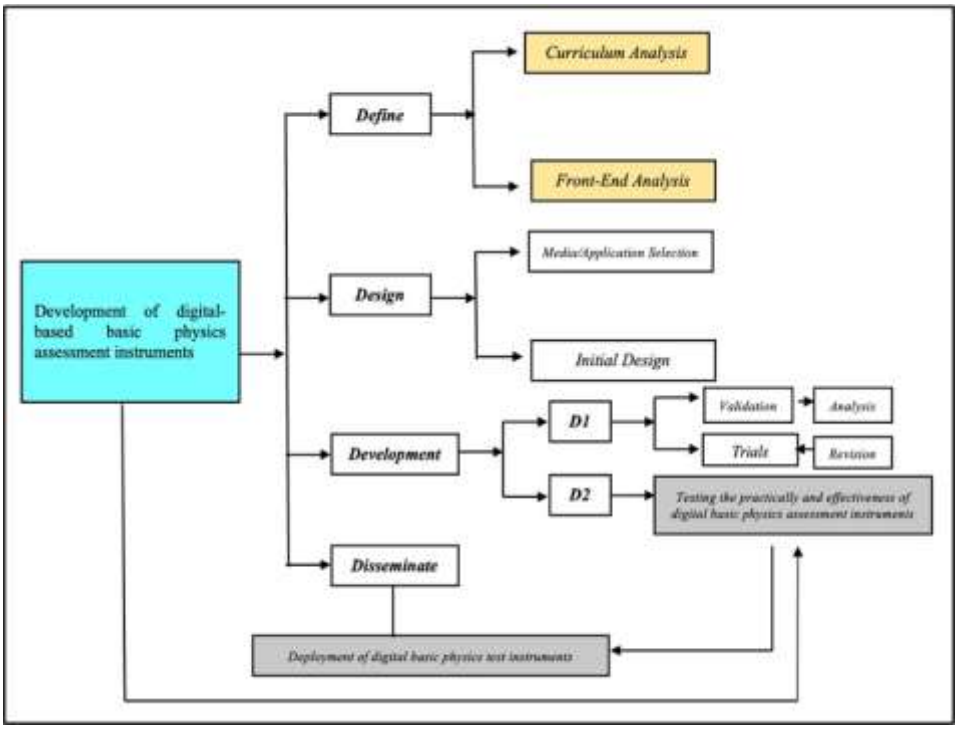

Figure 1. Research Flow Diagram

Validation tests the feasibility of the product and instrument being developed (Abubakar et al., 2022; Sustekova et al., 2019; Syahfitri et al., 2019). Three expert validation members are used at the research instrument's validation stage. Expert validation consists of content, assessment, and test media validation. The instruments validated are basic physics assessment instruments and user response sheets (lecturers and students). The basic physics assessment test instrument consists of two questions: multiple-choice tests and true-false tests. The validation results were analyzed using the Content Validity Index (CVI) method, using four assessment scales. The assessment scale can be seen in Table 1 below.

Table 1. Rating Scale by Experts

Value	Assessment Category
1	Irrelevant
2	Less relevant
3	Relevant
4	Very relevant

(Yusoff, 2019)

After the expert provides an assessment, the validation results are analyzed using the Microsoft Excel application. If the CVI value is ≥0.78, it is declared valid (Ameu et al., 2024). If the CVI value is ≥ 0.90, then the instrument is considered to have good content validity. Researchers also tested the instrument through limited trials, namely at Muhammadiyah University B, with a sample size of 5 students selected randomly.

The content tested in this study results from a mutual agreement between Muhammadiyah University A and Muhammadiyah University B. There are 11 main contents tested, namely: motion and force, kinematics, dynamics, energy and rotation of rigid bodies, impulse, and momentum, static and dynamic physics, thermal properties of substances, heat, kinetic theory of gases, entropy and cycle processes, and force and electric fields. Each content consists of two types of questions, namely true-false questions, and quizzes so there are a total of 55 question numbers. After going through a validation process by experts and limited trials, only 22 question

numbers were declared valid for use in the study. Of the 22 question numbers, 12 were in the form of quizzes and 10 were in the form of true-false questions.

After revising the instrument according to suggestions from the validator, the next research stage was testing it. Instrument testing is carried out to determine its effectiveness and practicality. Effectiveness testing was conducted by giving pretests and posttests to prospective teacher students at Muhammadiyah University A and Muhammadiyah University B. Data from the pretest and posttest results were analyzed using the Excel application. Participants in this study consisted of students from two Muhammadiyah universities, namely Muhammadiyah University A, with 14 students, and Muhammadiyah University B, with 12 students. The sample is the entire population because the number of students in both universities is limited. The research sample is a saturated sample.

3. RESULTS & DISCUSSION

Research into developing digital-based basic physics test instruments was designed using the Kahoot application. The Kahoot application is a game-based learning platform that allows lecturers and students to create and participate in interactive quizzes (Wirani et al., 2022). The types of questions in the Kahoot application are multiple-choice and true/false (Nurlina et al., 2022). In the Kahoot application, quizzes can be played in real time with many participants. The Kahoot application has several main features that are very suitable for use in online learning for students (Orhan Göksün & Gürsoy, 2019). These features are interactive quizzes, distance learning, surveys, discussions, and content libraries (Martín-Sómer et al., 2024). Therefore, the findings in this research are described according to the 4D stages, namely define, design, development, and dissemination.

Define Stages

The define stage consists of curriculum analysis and beginning-to-end analysis.

Curriculum Analysis

Curriculum analysis found that the preparation of the curriculum for the Physics Education Study Program at the University in Makassar, which was carried out in 2013, referred to the Higher Education Law Number 12 of 2012. Curriculum analysis of the curriculum at universities A and B used a curriculum based on the Indonesian national qualifications framework. Besides using this curriculum, college A has adjusted the independent campus independent learning curriculum. Now, both universities have made adjustments to the independent learning curriculum. This curriculum adjustment can be seen as lecture activities carried out in each study program. The lecture activities are student exchanges, teaching assistance, and entrepreneurship. This is in accordance with research conducted in Padang (Mairizwan et al., 2022). The curriculum that should be used in Physics and Physics Education Study Programs must accommodate and be able to teach abstract nature to prospective teacher students (Mekbib Alemu Vanessa Kind & Rajab, 2021).

Start-End Analysis

The final preliminary analysis found that most of the basic physics lecture assessments were still manual; students wrote answers on answer sheets, and the form of the test was an essay. This differs from research conducted at one of the Physics Education Study Programs, which developed a digital literacy test instrument with multiple choice questions to train prospective teacher students in literacy skills, especially digital literacy (Rizal et al., 2020). The infrastructure in the form of an internet connection and wifi network at UM Makassar and UNIMUDA Sorong is quite good, and they already have a wifi network. A Wi-Fi network provides many significant benefits for basic physics lectures. Students can quickly access various online learning resources, scientific journals, and additional materials that enrich their (Mohottige et al., 2022). Wi-Fi facilitates communication and collaboration through e-learning platforms and discussion forums, allowing students to easily collaborate and exchange ideas (O'Brien et al., 2022).

Design Stage

Several examples of learning outcomes test designs using the Kahoot application are documented.

(a) (b) (c) (d)

Figure 2. Example of displaying basic physics questions using the Kahoot application (a,b) multiple choice question form; (c,d) matter of right and wrong

Development Stage

In this case, the digital-based assessment tool with the help of Kahoot is an online test instrument (multiple choice questions, quiz questions, and true-false questions) in the Basic Physics course (Nurlina et al., 2023). In other universities, some use Kahoot as a quiz application. Still, it is limited to one question, namely multiple choice, and only one lecture topic (Diana et al., 2021). The discussion topics in the basic physics course consist of 10 chapters, namely, Measurement, Kinematics and Dynamics, Work and Energy, Elasticity and Spring Force, Momentum and Collisions, Rotation of Rigid Bodies, Geometry Optics, Electrical Circuits, Vibrations and Waves, Heat. After compiling each part of the assessment tool in the Basic Physics course, the next step is to carry out a validation process for the instruments developed based on suggestions given by the validator team by considering three aspects: material, construction, and language. Expert validation is carried out to see the content validity of the developed draft instrument. The Validator Team consists of 3 (three) experts to validate digital-based Physics assessment instruments in Basic Physics courses. The validator team consists of experts in physics and learning media. After receiving an expert assessment, the validation results are analyzed using the Content Validity Index (CVI) equation. An instrument's standard value is valid if it has a CVI value ≥ 0.78. The instrument's CVI calculation result is 0.85. Therefore, the instrument is declared valid. Apart from assessing each aspect, the validator's assessment is also in the form of comments and constructive suggestions for developing the digital assessment. These comments and suggestions can be seen in Table 2 below.

Table 2. Recap of Validator Suggestions and Comments

Aspect	Validator Comments
Conformity of content to the curriculum	Make sure all the material tested is in accordance with the applicable basic physics course curriculum. Topic coverage and depth of material must be appropriate.
Question quality	Pay attention to the quality of the questions. Questions should test correct understanding of basic physics concepts and support the development of critical thinking.
Variations in question types	Use a variety of question types such as multiple choice, short answer, and true/false to measure various aspects of knowledge and skills. Consider image or graphic based questions.

Immediate feedback	Take advantage of Kahoot's live feedback feature to provide brief explanations for each correct or incorrect answer, so students can quickly understand their mistakes.
Student involvement	Ensure that the use of Kahoot increases student involvement in the teaching and learning process. Interactive activities such as quizzes can increase motivation and active participation.
Accessibility and equality	Ensure all students have equal access to the devices needed to take digital tests. Consider students' special needs.
Security and honesty	Ensure the platform is used in a way that minimizes opportunities for cheating and that participant identities can be properly verified.
Sustainable development	Continue to evaluate and develop digital test assessments. Use feedback from students and fellow faculty to continuously improve.
Integration with other learning	Integrate results from Kahoot digital tests with other assessment methods in courses. Digital test results must contribute meaningfully to the student's overall assessment.

Table 2 summarises the validator comments given to the digital assessment instrument being developed. The material tested must be appropriate to the topic coverage and depth of the material. This aims to ensure that the test assessments developed follow established academic standards and that all relevant topics are covered (Istiyono et al., 2020). In the second aspect, the quality of the questions needs to be considered. This ensures that the assessments developed can accurately measure students' understanding and abilities. Diversity needs to be considered in the aspect of variations in question types. This aims to accommodate various student learning styles and provide a more comprehensive assessment (Murciano-Calles, 2020). Immediate feedback is provided to help students understand concepts better and correct their mistakes in real time. To access Kahoot-based digital assessments, aspects of accessibility and equality need to be considered (Farhan et al., 2024), and this is intended to ensure that all students have the same opportunity to succeed and that no one is marginalized (Cahyani et al., 2022). The security and honesty aspect is that researchers need to ensure the platform is used to minimize the opportunity for fraud and ensure that student identities are correctly verified. This aims to maintain the integrity of the assessment and ensure fair and accurate results. The aspect of continuous development is a long-standing note for validators. This ensures that the developed Kahoot-based digital assessment remains relevant and effective in measuring student competency (Asniza et al., 2021). Integrating with other learning is also a validator note for researchers to pay attention to. This provides a comprehensive picture of student performance and ensures a holistic assessment. Holistic assessment is an approach that assesses student performance as a whole, including cognitive, affective, and psychomotor aspects. This method combines assessments such as written tests, projects, presentations, and observations to provide a comprehensive picture of student abilities. Holistic assessment emphasizes real-world context, measures processes and outcomes, and encourages ongoing reflection and feedback. The main goal is to understand student performance in-depth, encourage continuous learning, develop skills, increase learning motivation, and create a fairer and more inclusive assessment environment. This approach ensures students understand and apply the concepts in real situations in fundamental physics courses.

Dissemination stage

The disseminating stage in developing a Kahoot-based digital test instrument for basic physics courses involves several important steps to ensure that lecturers and students can access, use, and adopt the test instrument. The steps taken at the dissemination stage are as follows:

Socialization

The socialization stage was carried out to introduce Kahoot-based digital test instruments to lecturers and students. The aim is for lecturers and student teachers to become familiar with the Kahoot application as a digital testing platform and understand its functionality and how to use it. A good introduction makes users feel more comfortable and confident using new technology. This can also foster interest and motivation in using Kahoot (Nadeem, 2020), increasing participation and involvement in teaching and learning. The socialization stage is also intended to align the test instruments with the learning objectives of introductory physics courses and ensure their suitability to the curriculum. This is designed to ensure that the test instruments are relevant and effective in measuring the expected learning outcomes (Malek et al., 2022).

Distribution of Test Instruments

Researchers share links or access codes at the test instrument distribution stage and provide usage guides and technical support. Please provide a link or access code to the digital test created in Kahoot and send it to lecturers and students via email or an online learning platform. The aim is to facilitate access and use of developed instruments, ensure the availability of information, increase communication efficiency, and increase user participation and involvement (Ristanto et al., 2022)

Feedback and Evaluation

The activities carried out at the feedback and evaluation stage include collecting feedback using surveys via Google Forms to collect opinions and suggestions from users (lecturers and students) after using digital tests. After that, researchers held a focus group discussion to gain deeper insight into the user experience. Then, they analyzed the collected data to identify the strengths and weaknesses of the test instrument.

Apart from learning user responses to the test instruments developed, researchers also tested digital test instruments at two universities: Muhammadiyah College A, located in the eastern part of Indonesia, and Muhammadiyah College B, located in the central part of Indonesia. The pretest and posttest test results data for each campus can be seen in Table 3 below.

Table 3. Statistical Parameters of Research Data

Statistical Parameters	**College**			
	A		**B**	
	Pretest	**Posttest**	**Pretest**	**Posttest**
Average value	33,86	52,00	54,25	70,00
Standard deviation	5,13	12,54	13,11	12,52
Maximum value	57,00	72,00	74,00	89,00
Minimum value	10,00	30,00	38,00	50,00
N-Gain	0,46 (medium)		0,55 (medium)	

Table 3. Statistical Parameters of Research Data provides an overview of the data in the form of average value, standard deviation, maximum value, minimum value, and N-gain value. It also shows the results of learning evaluations on two campuses, Campus A and Campus B, by comparing pretest and posttest scores and calculating N-gain to measure learning effectiveness.

At Campus A, the average student pretest score was 33.86, which increased to 52.00 on the posttest. This shows increased students' knowledge or skills after the learning intervention. The standard deviation of the pretest score was 15.13. It decreased to 12.54 in the posttest, which indicates that the variation or spread of student scores became smaller, and the results were more consistent after the intervention. The maximum score achieved by students increased from 57.00 on the pretest to 72.00 on the posttest, showing a significant increase in students with the highest scores. In addition, the minimum score also increased from 10.00 on the pretest to

30.00 on the posttest, showing substantial improvement for students with the lowest scores. The n-gain value at Campus A is 0.46, categorized as medium. This means that learning at Campus A is quite effective in improving students' knowledge or skills, although there is still room for further improvement.

At Campus B, the average student pretest score was 54.25, which increased to 70.00 on the posttest. This shows a more significant increase in student's knowledge or skills compared to Campus A after the learning intervention. The standard deviation of the pretest score was 13.11. It decreased slightly to 12.52 in the posttest, indicating that the variation in student scores became more consistent after the intervention, although not as large as the decrease in Campus A. The maximum score increased from 74.00 on the pretest to 89.00 on the posttest, showing a significant increase in students with the highest scores.

Additionally, the minimum score increased from 38.00 on the pretest to 50.00 on the posttest, indicating substantial improvement for students with the lowest scores. The n-gain value at Campus B is 0.55, also categorized as medium. This shows that learning at Campus B improves students' knowledge or skills and is slightly better than at Campus A.

Analysis of the N-Gain Value for each student at the two campuses can be seen in Figure 3 below:.

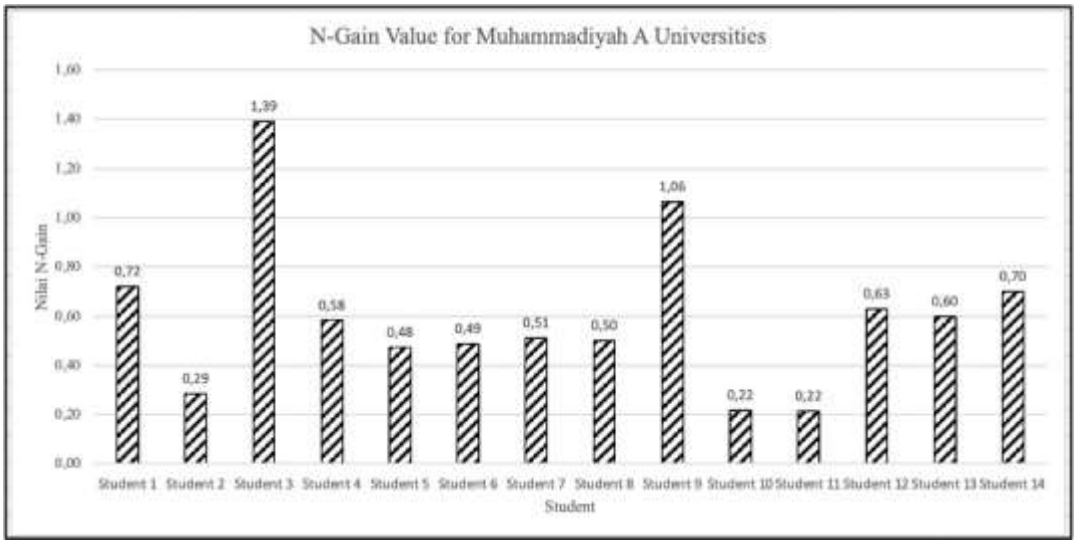

Figure 3. Obtained N-Gain Value at Campus A for Each Student

Figure 3 shows that most students on campus A experienced increased knowledge after implementing Kahoot-based digital assessment in learning. Several students showed very significant improvements. However, some students' improvement could be higher, and they still need further attention to understand their barriers to learning. Overall, the learning intervention is quite effective for most students, but there is room for improvement to ensure all students can achieve optimal improvement.

Apart from that, from Figure 3, it can also be seen that student improvement can be divided into three categories: high, medium, and low improvement. Students with high improvement were seen in the achievement of student 3, who had the highest N-gain value of 1.39, showing a very significant improvement after the learning intervention. Student 9 has an n-gain value of 1.06, also showing a considerable increase. Students with moderate increases seen in students 1, 12, and 14 have n-gains between 0.6 to 0.70. This shows a significant improvement in their knowledge. Students 4, 6, 7, and 8 had n-gain values between 0.48 and 0.58, which also falls into the moderate improvement category. Students with low improvement, seen in student 2, have an n-gain of 0.29, indicating low improvement. Students 10 and 11 have an n-gain of 0.22, indicating a low increase.

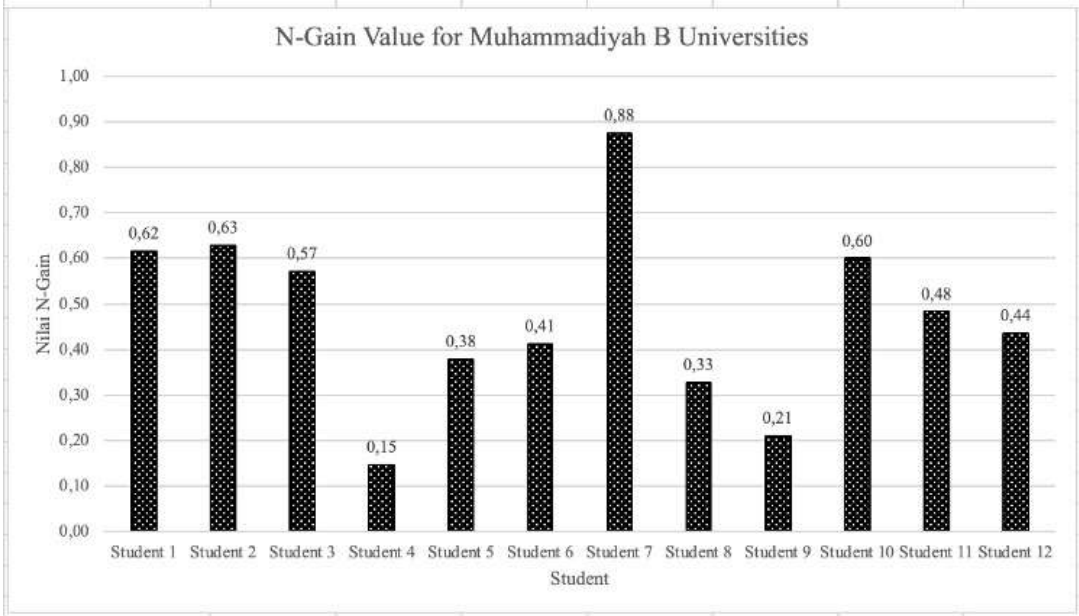

Figure 4. Obtained N-Gain Value at Campus A for Each Student

Enhancements and Updates

Refining and updating activities include revising, retesting, and periodic updates. Based on the feedback received, the test instrument is revised, with revisions to the questions, format, and test features to improve its quality and effectiveness. The updated version is retested to ensure that the improvements have succeeded. Regular updates to the test instrument are carried out to ensure the content remains relevant and in line with the latest developments in physics education.

4. CONCLUSION

This research shows that using Kahoot-based digital assessments improves student understanding and skills. The research results showed a significant increase in posttest scores compared to the pretest, with n-gain scores generally being in the medium to high category. Students are more motivated and active in taking Kahoot interactive quizzes, which makes the teaching and learning process more exciting and varied. Kahoot's ease of access and use for lecturers and students and the immediate feedback it provides help students understand concepts better. The results analysis feature on Kahoot also makes it easier for lecturers to evaluate student performance and adjust learning strategies according to needs.

This study shows that the use of Kahoot! as a digital-based assessment tool in the Basic Physics course has a positive impact on the learning experience of prospective teacher students. The use of Kahoot! not only increases student participation and engagement during the learning process, but also provides fast and effective feedback in understanding the material being taught. In addition, Kahoot! helps create a more interactive and enjoyable learning atmosphere, which can reduce student anxiety about test-based assessments. The use of Kahoot! also shows an increase in students' critical thinking skills, especially in solving quizzes that require a deep understanding of concepts. However, this study also found that not all questions can be declared valid for use in this digital format, indicating the need for more attention in compiling questions.

Researchers recommend further development of Kahoot-based digital assessments to better suit student needs. In addition, further research should focus on developing students' critical thinking and collaboration skills.

5. Acknowledgements

The author would like to express his deepest gratitude to the Muhammadiyah Central Leadership Higher Education Research and Development Council (Diktilitbang) for the support and funding provided in this collaborative research scheme with contract number 0258.376/I.3/D/2024. With this support, this research was carried out correctly.

We would also like to express our appreciation to all parties who have contributed, either directly or indirectly, to the completion of this research. Thank you to the lecturers and students who participated and provided valuable input during the research process. We also give special appreciation to colleagues who have provided moral and intellectual support throughout this research.

6. REFERENCES

1. Abubakar, A. M., Ariffin, T. F. T., & Jaafar, F. M. (2022). Teacher resilience instrument: Development and validation of a four-factor model. *International Journal of Evaluation and Research in Education*, *11*(2), 707–714. https://doi.org/10.11591/ijere.v11i2.20880.
2. alsswey, A., & Malak, M. Z. (2024). Effect of using gamification of "Kahoot!" as a learning method on stress symptoms, anxiety symptoms, self-efficacy, and academic achievement among university students. *Learning and Motivation*, *87*, 101993. https://doi.org/https://doi.org/10.1016/j.lmot.2024.101993.
3. Ameu, N. C., Yusoff, R. C. M., Rahim, N. Z. A., Ibrahim, R., & Zainuddin, N. M. (2024). Content Validity For Digital Employee Experience Assessment. *Procedia Computer Science*, *234*, 1288–1295. https://doi.org/https://doi.org/10.1016/j.procs.2024.03.126.
4. Arlinwibowo, J., Ishartono, N., Linguistika, Y., Purwoko, D., & Suprapto. (2023). Gamification in the Stem Domain Subject: the Prospective Method To Strengthen Teaching and Learning. *Jurnal Pendidikan IPA Indonesia*, *12*(4), 562–572. https://doi.org/10.15294/jpii.v12i4.48388.
5. Asniza, I. N., Zuraidah, M. O. S., Baharuddin, A. R. M., Zuhair, Z. M., & Nooraıda, Y. (2021). Online Game-Based Learning Using Kahoot! to Enhance Pre-University Students' Active Learning: A Students' Perception in Biology Classroom. *Journal of Turkish Science Education*, *18*(1), 145–160. https://doi.org/10.36681/tused.2021.57.
6. Baszuk, P. A., & Heath, M. L. (2020). Using Kahoot! to increase exam scores and engagement. *Journal of Education for Business*, *95*(8), 548–552. https://doi.org/10.1080/08832323.2019.1707752.
7. Cadet, M. J. (2023). Application of game-based online learning platform: Kahoot a formative evaluation tool to assess learning. *Teaching and Learning in Nursing*, *18*(3), 419–422. https://doi.org/https://doi.org/10.1016/j.teln.2023.03.009.
8. Cahyani, D. R., Kurniasih, D., & Fadhillah, R. (2022). Kahoot!-based evaluation instruments on acid-base materials. *Journal of Education and Learning (EduLearn)*, *16*(1), 16–24. https://doi.org/10.11591/edulearn.v16i1.20332.
9. Chen, Z., Jiao, J., & Hu, K. (2021). Formative assessment as an online instruction intervention: Student engagement, outcomes, and perceptions. *International Journal of Distance Education Technologies*, *19*(1), 50–65. https://doi.org/10.4018/IJDET.20210101.oa1.
10. Dhawan, S. (2020). Online Learning: A Panacea in the Time of COVID-19 Crisis. *Journal of Educational Technology Systems*, *49*(1), 5–22. https://doi.org/10.1177/0047239520934018.
11. Diana, N., Latifah, S., Yuberti, Komikesari, H., Rohman, M. H., & Tiyan, Lady. (2021). Developing an e-learning-based critical-thinking assessment as a physics learning evaluation media with Kahoot! interactive quiz. *IOP Conference Series: Earth and Environmental Science*, *1796*(1). https://doi.org/10.1088/1742-6596/1796/1/012055.
12. Farhan, A., Herliana, F., Salsabila, F., Putri, M., Zainuddin, & Nurulwati. (2024). *Utilization of the Kahoot Application to Minimize Academic Dishonesty Students in Physics Examinations BT - Proceedings of the 2nd Annual International Conference on Mathematics, Science and Technology Education (AICMSTE 2023)*. 268–276. https://doi.org/10.2991/978-2-38476-216-3_28.

13. Gao, B. W., Jiang, J., & Tang, Y. (2020). The effect of blended learning platform and engagement on students' satisfaction—— the case from the tourism management teaching. *Journal of Hospitality, Leisure, Sport and Tourism Education*, *27*(November 2019), 100272. https://doi.org/10.1016/j.jhlste.2020.100272.
14. Istiyono, E., Dwandaru, W. S. B., Setiawan, R., & Megawati, I. (2020). Developing of computerized adaptive testing to measure physics higher order thinking skills of senior high school students and its feasibility of use. *European Journal of Educational Research*, *9*(1), 91–101. https://doi.org/10.12973/eu-jer.9.1.91.
15. Klein, P., Ivanjek, L., Dahlkemper, M. N., Jeličić, K., Geyer, M. A., Küchemann, S., & Susac, A. (2021). Studying physics during the COVID-19 pandemic: Student assessments of learning achievement, perceived effectiveness of online recitations, and online laboratories. *Physical Review Physics Education Research*, *17*(1), 1–11. https://doi.org/10.1103/PhysRevPhysEducRes.17.010117.
16. Langenfeld, T., Burstein, J., & von Davier, A. A. (2022). Digital-First Learning and Assessment Systems for the 21st Century. *Frontiers in Education*, *7*. https://doi.org/10.3389/feduc.2022.857604.
17. Ma'Ruf, M., Marisda, D. H., & Handayani, Y. (2019). The basic physical program based on education model online assisted by alfa media to increase creative thinking skills. *Journal of Physics: Conference Series*, *1157*(3), 0–5. https://doi.org/10.1088/1742-6596/1157/3/032068.
18. Ma'ruf, Marisda, D. H., Sultan, A. D., B, F. C. A., & L, W. D. (2024). Development of Collaborative Online Learning Model Based on Case Method in Optics Courses to Train Creative and Communication Skills. *Jurnal Penelitian Pendidikan IPA*, *10*(9), 6655–6661. https://doi.org/10.29303/jppipa.v10i9.8448.
19. Mairizwan, M., Hidayati, H., Dewi, W. S., Afrizon, R., & Jarlis, R. (2022). Increasing the Competence of Physics Teachers in Designing PjBL-Based Teaching Aids for the Implementation of the Merdeka Curriculum. *Jurnal Penelitian Pendidikan IPA*, *8*(6), 2948–2953. https://doi.org/10.29303/jppipa.v8i6.2585.
20. Malek, N. A., Abdullah, N. S. Y., Mat Darus, M., & Nursulistiyo, E. (2022). A Need Analysis for the Development of Physics Game-based Interactive Module in Matriculation College. *EDUCATUM Journal of Science, Mathematics and Technology*, *9*(Sp), 48–60. https://doi.org/10.37134/ejsmt.vol9.sp.6.2022.
21. Marisda, D. H., Rahmawati, Ma'ruf, & Bancong, H. (2023). Preliminary research on the development of digital hypercontent modules in mathematical physics subjects. *The 3rd IInternational Conference On Science, Mathematics, Environment, And Education: Flexibility in Research and Innovation on Science, Mathematics, Environment, and Education for Sustainable Development*, *2540*(January), 090002. https://doi.org/10.1063/5.0105890.
22. Martín-Sómer, M., Casado, C., & Gómez-Pozuelo, G. (2024). Utilising interactive applications as educational tools in higher education: Perspectives from teachers and students, and an analysis of academic outcomes. *Education for Chemical Engineers*, *46*, 1–9. https://doi.org/https://doi.org/10.1016/j.ece.2023.10.001.
23. Mekbib Alemu Vanessa Kind, M. B. K. M. M. A. P. K., & Rajab, T. (2021). The knowledge gap between intended and attained curriculum in Ethiopian teacher education: identifying challenges for future development. *Compare: A Journal of Comparative and International Education*, *51*(1), 81–98. https://doi.org/10.1080/03057925.2019.1593107.
24. Mohottige, I. P., Gharakheili, H. H., Moors, T., & Sivaraman, V. (2022). Modeling Classroom Occupancy Using Data of WiFi Infrastructure in a University Campus. *IEEE Sensors Journal*, *22*(10), 9981–9996. https://doi.org/10.1109/JSEN.2022.3165138.
25. Murciano-Calles, J. (2020). Use of Kahoot for Assessment in Chemistry Education: A Comparative Study. *Journal of Chemical Education*, *97*(11), 4209–4213. https://doi.org/10.1021/acs.jchemed.0c00348.
26. Nadeem, N. (2020). *Kahoot! Quizzes: A Formative Assessment Tool to Promote Students' Self-Regulated Learning Skills Metaphor theory and multi-modal conceptual belnds View project*. *June*. https://www.researchgate.net/publication/342436812.
27. Nielsen, W., Georgiou, H., Jones, P., & Turney, A. (2020). Digital Explanation as Assessment in University

Science. *Research in Science Education*, *50*(6), 2391–2418. https://doi.org/10.1007/s11165-018-9785-9.

28. Nurlina, Marisda, D. H., Riskawati, Sultan, A. D., Sukmawati, & Akram. (2022). Assessment On Digitalization Of Basic Physics Courses: Need Analysis On The Use Of Digital-Based Assessment. *Jurnal Pendidikan IPA Indonesia*, *11*(4), 531–541. https://doi.org/10.15294/jpii.v11i4.39191.
29. O'Brien, O., Sumich, D. A., Kanjo, D. E., & Kuss, D. D. (2022). WiFi at University: A Better Balance between Education Activity and Distraction Activity Needed. *Computers and Education Open*, *3*, 100071. https://doi.org/https://doi.org/10.1016/j.caeo.2021.100071.
30. Orhan Göksün, D., & Gürsoy, G. (2019). Comparing success and engagement in gamified learning experiences via Kahoot and Quizizz. *Computers & Education*, *135*, 15–29. https://doi.org/https://doi.org/10.1016/j.compedu.2019.02.015.
31. Resta, N. N., Halim, A., Mustafa, & Huda, I. (2020). Development of e-learning-based three-tier diagnostics test on the basic physics course. *Journal of Physics: Conference Series*, *1460*(1). https://doi.org/10.1088/1742-6596/1460/1/012131.
32. Ristanto, R. H., Kristiani, E., & Lisanti, E. (2022). Flipped Classroom–Digital Game-Based Learning (FC-DGBL): Enhancing Genetics Conceptual Understanding of Students in Bilingual Programme. *Journal of Turkish Science Education*, *19*(1), 328–348. https://doi.org/10.36681/tused.2022.1124.
33. Rizal, R., Rusdiana, D., Setiawan, W., & Siahaan, P. (2020). Digital Literacy Test: Development of Multiple Choice Test for Preservice Physics Teachers Physics of Music View project Teaching Simulator View project Digital Literacy Test: Development of Multiple Choice Test for Preservice Physics Teachers. *International Journal of Advanced Science and Technology*, *29*(03), 7085–7095. https://www.researchgate.net/publication/341264530.
34. Suharsono, A. (2020). The Use of Quizizz and Kahoot! in the Training for Millennial Generation. *IJIET (International Journal of Indonesian Education and Teaching)*, *4*(2), 332–342. https://doi.org/10.24071/ijiet.v4i2.2399.
35. Sustekova, E., Kubiatko, M., & Usak, M. (2019). Validation of critical thinking test on Slovak conditions. *Eurasia Journal of Mathematics, Science and Technology Education*, *15*(12). https://doi.org/https://doi.org/10.29333/ejmste/112295.
36. Syahfitri, J., Firman, H., Redjeki, S., & Sriyati, S. (2019). Development and validation of critical thinking disposition test in biology. *International Journal of Instruction*, *12*(4), 381–392. https://doi.org/10.29333/iji.2019.12425a.
37. Thomassen, G., Van Passel, S., & Dewulf, J. (2020). A review on learning effects in prospective technology assessment. *Renewable and Sustainable Energy Reviews*, *130*(December 2019), 109937. https://doi.org/10.1016/j.rser.2020.109937.
38. Wang, A. I., & Tahir, R. (2020). The effect of using Kahoot! for learning – A literature review. *Computers & Education*, *149*, 103818. https://doi.org/https://doi.org/10.1016/j.compedu.2020.103818.
39. Wirani, Y., Nabarian, T., & Romadhon, M. S. (2022). Evaluation of continued use on Kahoot! as a gamification-based learning platform from the perspective of Indonesia students. *Procedia Computer Science*, *197*, 545–556. https://doi.org/https://doi.org/10.1016/j.procs.2021.12.172.
40. Yusoff, M. S. B. (2019). ABC of Content Validation and Content Validity Index Calculation. *Education in Medicine Journal*, *11*(2), 49–54. https://doi.org/10.21315/eimj2019.11.2.6.
41. Zhang, Q., & Yu, Z. (2021). A literature review on the influence of Kahoot! On learning outcomes, interaction, and collaboration. *Education and Information Technologies*, *26*(4), 4507–4535. https://doi.org/10.1007/s10639-021-10459-6.
42. Zhang, R., Bi, N. C., & Mercado, T. (2022). Do zoom meetings really help? A comparative analysis of synchronous and asynchronous online learning during Covid-19 pandemic. *Journal of Computer Assisted Learning*, 1–8. https://doi.org/10.1111/jcal.12740.

INFO

Corresponding Author: **Nurlina, Postgraduate Education Science, Muhammadiyah University of Makassar, South Sulawesi, Indonesia.**

How to cite/reference this article: **Nurlina, Dewi Hikmah Marisda, Ratna Prabawati, Sirojuddin, Harnessing Kahoot! For Digital Physics Assessments: Enhancing Engagement and Learning Outcomes in Prospective Teacher Education, *Asian. Jour. Social. Scie. Mgmt. Tech*. 2025; 7(1): 19-31.**