Paedagoria : Jurnal Kajian, Penelitian dan Pengembangan Kependidikan
http://journal.ummat.ac.id/index.php/paedagoria
P-ISSN 2086-6356 | e-ISSN 2614-3674
Vol. 17, No. 3, July 2026, pp. 581-590

The Effect of Kahoot-Assisted Games Based Learning Model on Students' Computational Thinking in Science Learning

Fauzatul Ma'rufah Rohmanurmeta[1]*, Ivayuni Listiani[2], Gupi Rohman Nurmansyah[3]
[1]Primary Teacher Education, Universitas PGRI Madiun, Indonesia
[2]Basic Education, Universitas PGRI Madiun, Indonesia
[3]Curriculum Development, Universitas Pendidikan Indonesia, Indonesia
Email all authors: [1]fauzatul@unipma.ac.id, [2]ivayuni@unipma.ac.id, [3]gupirn@gmail.com

ARTICLE INFO

Article History:

Received : 14-04-2026
Revised : 04-07-2026
Accepted : 06-07-2026
Online : 10-07-2026

Keywords:
Computational Thinking;
Games Based Learning Model;
Kahoot;
Science Learning.

ABSTRACT

The low level of students' Computational Thinking often stems from a lack of interest, inadequate conceptual understanding, or ineffective teaching methods. This study aims to examine the effect of the Games Based Learning (GBL) model assisted by Kahoot media on the Computational Thinking of elementary school students. This study uses a quantitative approach with a Pre-Experimental design of the One Group Pretest-Posttest type. The data collection technique used is a written test consisting of 5 essay questions. Data analysis uses descriptive tests, normality tests, and hypothesis tests. The results of the paired t-test data analysis show a significance value (p-value) <0.05 which results in the rejection of the null hypothesis (H0) and the acceptance of the alternative hypothesis (H1) clearly indicating a positive and significant effect of this intervention. The average Post-test score (76.93) increased drastically compared to the Pre-test (52.43) which proves that GBL supported by Kahoot is effective in improving students' Computational Thinking abilities in science learning. Based on the findings of this study, it can be concluded that the implementation of the GBL learning model supported by Kahoot media has a positive and significant influence on improving students' Computational Thinking in science learning. Therefore, this model is recommended as a prospective pedagogical strategy. For further studies, it is recommended to use a more robust experimental design with a control group and consider a longer intervention duration, as well as complement it with qualitative evaluation for a deeper understanding.

A. INTRODUCTION

In today's era of globalization and rapid technological advancement, attention to education is crucial. Education is a vital element in human life, playing a role in developing high-quality and skilled human resources, enabling them to keep pace with increasingly sophisticated developments (Alwafi, 2023). Education in this modern era is not limited to school learning and formal knowledge, but also encompasses various specialized skills necessary for everyday life (Arzfi dkk., 2025). Therefore, learning methods are needed that can hone each individual's critical thinking. Science is a field of study that fosters problem-solving thinking skills in students, enabling them to develop a deeper understanding of complex problem-solving (Zufahmi dkk., 2025).

Science is a discipline taught from elementary school to higher education (Tiep & Thi Huong, 2026). As stated by (Suendarti & Virgana, 2022), science lessons play a crucial role in shaping students' thinking patterns. Science is closely related to all human activities because its applications are inseparable from the context of everyday life (Hu, 2024). Despite its crucial role, many students find science challenging and intimidating, as they view it as a subject filled with knowledge about the universe through observation and experimentation to understand physical and non-physical human phenomena (Fitria dkk., 2024). Consequently, studying science requires advanced skills to address the challenges that arise in science problems. Therefore, to facilitate students' understanding of science, it is necessary to develop structured thinking skills that mimic the workings of computer science to solve problems, either independently, by computer systems, or by both (Wahyuni dkk., 2025). This ability is called Computational Thinking.

Computational thinking is the process of breaking down complex problems into manageable parts, identifying patterns, discovering general principles, and designing systematic solution steps so that solutions can be understood and implemented by humans (De Jesus & Silveira, 2021). This is in line with the view (Suarsana dkk., 2025) that computational thinking is an essential skill for students, enabling them to address the scientific challenges that arise in everyday life. Computational thinking encompasses four main stages: decomposition, pattern recognition, abstraction, and algorithms (Muhammad dkk., 2023). The importance of these skills can help students analyze and find solutions to complex problems in a structured manner. Computational thinking can equip students with essential skills in the digital era that can be applied in various fields of life and industry (Gilchrist dkk., 2021). These skills can also train someone to think critically, logically, and systematically in facing challenges.

Based on the PISA survey conducted by the OECD, students' scientific abilities in Indonesia remain very concerning. In 2022, Indonesia's scientific literacy score was 383, a slight decrease compared to 2018 . This decrease was due to learning lags influenced by various aspects related to education. Achieving a golden Indonesia by 2045 requires the support of high-quality science skills. Unfortunately, the science ability scores supported by PISA do not reflect the high quality of Indonesian students. These results indicate that students' competence in solving science problems remains at a low level. Furthermore, initial test results at SDN 1 Plalangan showed that students still struggle to understand and solve science-related problems.

Based on the analysis of student work results, it shows that students' systematic problem-solving ability, or Computational Thinking, in science learning shows suboptimal achievement based on the Computational Thinking ability indicator. Students only succeeded in demonstrating the ability to analyze scientific information from existing problems, but were not yet able to identify solutions using clear steps for complex problems. Students were not yet able to break problems into smaller parts to recognize patterns and eliminate irrelevant things.

Improving students' computational thinking skills can be done by implementing the Games-Based Learning model (Pala, 2025). This model is very effective and important to implement to facilitate student participation to be actively involved with direct

involvement in the learning process (Chaves-Yuste dkk., 2025). The application of Games-Based Learning can be a forum for developing student abilities (Naccache dkk., 2025). This learning model integrates educational elements with games, which aims to increase student interest and participation in the learning process (Chaves-Yuste dkk., 2025). Elements of educational materials can be combined into the form of games with the aim of increasing student interest and motivation to learn through fun interactive media (Lu & Chen, 2025). The use of this learning model is one of the appropriate learning activities to teach students and can evaluate and link concepts to improve students' computational thinking (Naccache dkk., 2025).

The Game-Based Learning model can be more engaging when presented using the Kahoot application (Cahyani dkk., 2022). Using the Kahoot application is one way to implement interactive game-based learning techniques (Cahyani dkk., 2022). Kahoot is a highly instructive website because it provides tools that can be utilized as media in the learning process (Warsihna dkk., 2019). One formative assessment tool that can be used to determine each student's progress towards learning objectives is Kahoot (Inayah dkk., 2021). This application is a game-based learning platform. Kahoot provides solutions to several problems encountered (Afifah & Atmazaki, 2024). The application can be implemented with an internet connection and an existing PC. Students can also access Kahoot using smartphones, making it more useful.

The Kahoot-assisted Games-Based Learning model can improve students' Computational Thinking in science learning (Mumcu dkk., 2025). Science subjects, often considered difficult, can become easier by providing meaningful experiences for students when the Kahoot-assisted Games-Based Learning model is applied (Litualy dkk., 2022). Students are more active in learning, thereby eliminating boredom. This condition allows students to think clearly to solve problems using thought processes in breaking down complex problems into smaller parts, identifying patterns, focusing on important information, and creating efficient solution steps (Annetta dkk., 2025). This competency is very important to be used in science learning.

Based on the low computational thinking abilities of students at SDN 1 Plalangan, as obtained from interviews and initial tests, the problem was found to be students' difficulties in analyzing and solving complex problems in science learning. This condition indicates the need for computational thinking in science learning. Therefore, this study is important to provide concrete solutions to improve students' computational thinking in science learning. This study offers an approach that differs from previous research conducted by (Wanglang dkk., 2024) by integrating a game-based learning model using the Kahoot application. This research provides a novel approach, demonstrating that using Kahoot provides a more interactive, competitive learning environment and provides immediate feedback. Students are more motivated to think critically when solving problems. In contrast, Game-Based Learning without Kahoot tends to have a more limited level of interactivity and feedback, so it doesn't stimulate students' computational thinking skills as optimally as using Kahoot. Therefore, integrating Kahoot into a Game-Based Learning model can provide a more engaging, active, and effective science learning experience in developing students' computational thinking skills.

B. METHODS

This study uses an experimental method to identify the impact of independent variables on the dependent variable. A quantitative approach is used in this study with a focus on collecting and analyzing statistical data to test previously formulated hypotheses. A quantitative approach is defined as a research method based on the philosophy of positivism, which allows researchers to analyze populations or samples using valid and reliable research instruments (Thomas dkk., 2025). This study was conducted at SDN 1 Plalangan on fifth-grade students. The research sample was 27 students from a total student population of 143.

This study employed a pre-experimental design with a One-Group Pretest-Posttest. The main characteristic of this design is the presence of a pretest measurement conducted before the subjects received treatment. Treatment effectiveness can be measured more accurately by comparing conditions before and after the intervention (Disman dkk., 2017; Haviz & Maris, 2018). This study, involving one experimental class, sought to identify the effect of the Games-Based Learning model on students' Computational Thinking abilities. This research design can be illustrated as follows:

Table 1. Research Design

Pretest	Treatment	Posttest
O_1	X	O_2

The pretest (O1) is a measurement of the dependent variable before treatment is administered. The experimental treatment or intervention is symbolized by "X." After the treatment is administered, the posttest (O2) is a re-measurement of the variable against changes in the dependent variable, measured by comparing O1 and O2.

The research procedure includes various stages, starting from preparation, implementation, data analysis and drawing conclusions (Mondal & Mondal, 2018). The dependent variable of this research is Computational Thinking ability, while the independent variable is the Games Based Learning model assisted by Kahoot on students' Computational Thinking in science learning. This research uses learning instruments and test instruments. The learning instrument contains teaching modules and student worksheets (LKPD) while the test instrument is in the form of 5 descriptive questions given as a pretest and posttest to measure students' Computational Thinking abilities. The implementation of the research involves administering a pretest before the intervention, followed by the implementation of the Games Based Learning model assisted by Kahoot media treatment and ending with a posttest. After the data is collected, data analysis is carried out. The data analysis techniques applied include descriptive analysis, normality test, and paired t-test to test the hypothesis.

C. RESULT AND DISCUSSION

To measure students' computational thinking, a pretest with three descriptive questions was conducted over 90 minutes before the Game-Based Learning intervention using Kahoot. After the intervention, a posttest was administered to assess students' computational improvement. The pretest and posttest results are presented in Table 2.

Table 2. Descriptive Test Results of Pretest and Posttest

	N	Minimum	Maksimum	Mean	Std. Deviation
Pretest	27	31	65	53,54	8,224
Posttest	27	65	87	80,92	5,731
Valid N (listwise)	27				

The table shows that this study involved 27 participants (N). Pretest scores ranged from 31 to a maximum of 65, with a mean of 53.54 and a standard deviation of 8.224. In contrast, posttest scores had a minimum of 65 and a maximum of 87, with a mean of 80.92 and a standard deviation of 5.731.

Before examining the differences between pretest and posttest results, it is important to conduct a normality test to verify the assumption of a normal data distribution. Due to the small sample size (less than 50 participants), the Shapiro-Wilk test was used. The results of the normality test, as generated by SPSS 30.0, are presented below.

Table 3. Normality Test Results

Normality Test			
	Shapiro-Wilk		
	Statistics	Df	Sig.
Pretest	.934	27	.136
Posttest	.935	27	.135

Based on the "Normality Test" table above, the results of the Shapiro-Wilk test for the pretest and posttest data are presented. For the pretest data, the Shapiro-Wilk statistic value was 0.934 with 27 degrees of freedom (df) and a significance value of 0.136. Meanwhile, for the posttest data, the statistic value was 0.935 with 27 degrees of freedom (df) and a significance value of 0.135. Because the significance value is greater than the standard significance level (α = 0.05), it indicates that the pretest and posttest data were normally distributed. After verifying normality using the Shapiro-Wilk test, a paired-sample t-test was conducted to evaluate the difference in means between the paired samples. The results of the hypothesis testing are then presented based on the output generated by SPSS 30.0.

Table 4. Hypothesis Test Results

Paired Samples Test			
			Pair 1
			Pretest-Posttest
Paired Differences	Mean		-23.400
	95% Confidence Interval of the Difference	Lower	-27.134
		Upper	-21.727
Significance	One-Sided p		<.001
	Two Sided p		.000

Analysis using a paired sample t-test revealed a statistically significant difference between pretest and posttest scores at a significance level of $p < 0.001$. The mean difference of -23.400 reflects a substantial improvement in student scores, with the mean increasing from 53.54 to 80.92. The 95% confidence interval between -27.134 and -21.727 further strengthens this result. With a p-value less than 0.05, the null hypothesis (H0) is definitively rejected, favoring the acceptance of the alternative hypothesis (H1).

Statistical analysis revealed that the implementation of the Games Based Learning (GBL) model assisted by the Kahoot platform had a significant impact on improving students' Computational Thinking. The paired samples test yielded a p-value <0.05, indicating a significant difference between the pretest and posttest scores. The average pretest score of 53.54 increased to 80.92 in the posttest, while the standard deviation decreased from 8.224 to 5.731, indicating an increase in scores. Thus, the alternative hypothesis (H1) was accepted, stating that the Games Based Learning model with Kahoot had a positive and significant impact on Computational Thinking. This finding is in line with previous research by (Afifah & Atmazaki, 2024; De Jesus & Silveira, 2021; Inayah dkk., 2021; Wanglang dkk., 2024), which showed that the Games Based Learning model assisted by Kahoot was effective in improving students' computational thinking in science learning. In addition, research (Budiyanto dkk., t.t.; De Jesus & Silveira, 2021; Kaya dkk., 2025, 2025) showed that the Games Based Learning model can significantly improve students' computational thinking, from 0% to more than 60% in science learning. These findings support cognitive development at the formal operational stage, which is characterized by the development of logical and abstract thinking skills as well as systematic problem solving. Game-based learning creates a learning environment that stimulates logical and abstract thinking skills through active interaction, challenges, and immediate feedback within educational game activities (Hu, 2024). Kahoot, as an interactive digital medium, reinforces the learning process by providing various activities such as quizzes, puzzles, and matching games, encouraging students to reconstruct scientific concepts through assimilation and accommodation (Afifah & Atmazaki, 2024). These activities help students develop more complex scientific thinking patterns, enhancing their mastery of symbols and numbers, and effectively solving contextual problems.

This study provides evidence that learning that integrates contextual elements with technology is highly suitable for Generation Z students, who show a significant preference for digital and visual stimuli. Furthermore, the findings reinforce this by stating that the positive use of gadgets can improve students' understanding of difficult material, especially when presented in an educational game format. Therefore, the implementation of the Games-Based Learning model with the help of Kahoot shows significant potential to meet students' preferences for engaging content while simultaneously encouraging increased cognitive engagement. In the context of learning media, Kahoot offers various advantages for designing more interactive, effective, efficient, and engaging learning experiences (Afifah & Atmazaki, 2024). Furthermore, ease of access is a key feature, as Kahoot can be accessed from mobile devices or laptops without the need to download an application. This facility is not limited to providing practice questions; the platform also

incorporates gamification elements to facilitate student learning through the concept of games. However, one of Kahoot's weaknesses is the potential for disruption during use due to its dependence on a stable network connection (Afifah & Atmazaki, 2024). Based on empirical evidence, Kahoot has been shown to improve numeracy competency in learning contexts.

D. CONCLUSION AND SUGGESTIONS

This study concludes that the game-based learning model implemented through the Kahoot platform has a positive and crucial impact on improving students' computational thinking. A paired sample t-test showed a statistically significant difference in the mean pretest score of 53.54 and posttest score of 80.92 ($p < 0.001$), accompanied by higher homogeneity of scores after the intervention. Thus, the null hypothesis is definitively rejected. The essence of these findings indicates that the Game-Based Learning model with Kahoot is not only effective in improving students' computational thinking but also a highly relevant and appropriate learning model for the characteristics of Generation Z students who have a preference for digital and visual stimuli. This approach has the potential to be an effective pedagogical strategy to encourage cognitive engagement and improve understanding of complex material.

Research findings on the influence of game-based learning models assisted by Kahoot on students' computational thinking skills in science learning indicate that the integration of technology and game elements in learning can be an effective strategy to improve students' computational thinking skills. The use of Kahoot can create a more interactive and enjoyable learning atmosphere and encourage active student involvement during the learning process. In addition, the quizzes, direct feedback, and challenges contained in Kahoot help students develop logical thinking skills, recognize patterns, conduct problem analysis, and develop problem solving strategies, which are key components of computational thinking. Therefore, teachers can utilize Kahoot as an alternative innovative learning media in science learning and other subjects to support the development of 21st-century skills.

Based on the research results, it is recommended that further research test the effectiveness of the Kahoot-assisted game-based learning model at different educational levels, subjects and student characteristics in order to obtain a broader picture of its influence on computational thinking abilities. Future research can also examine the effect of using Kahoot on other aspects such as creativity, problem-solving abilities, collaboration, and student learning motivation. In educational practice, schools and teachers need to increase the use of digital technology in the learning process through training and developing teacher competency. Apart from that, support from adequate technological facilities and infrastructure is needed so that the implementation of game-based learning can run optimally and sustainably in improving the quality of science learning.

ACKNOWLEDGEMENT

The authors would like to express their gratitude to all parties who have assisted and supported the implementation of this research, especially Universitas PGRI Madiun for providing the opportunity to conduct this research. Thanks also to the material and media validators who have been willing to take the time to provide assessments, suggestions, and constructive input for improving the Kahoot-assisted learning model used. Sincere gratitude is also extended to the principal, teachers of SDN 1 Plalangan, and fifth-grade students of SDN 1 Plalangan who have agreed to be research subjects and provided support and active participation in the research implementation process. The authors also express their gratitude to their families and colleagues for their prayers, enthusiasm, and unwavering support throughout the research process. Hopefully, this research can provide benefits for the world of education, especially in science learning. The authors hope that this research can inspire other educators and researchers to continue developing learning innovations that are relevant to the local context and student needs.

REFERENCES

Afifah, A., & Atmazaki, A. (2024). The Effect of Kahoot-based Team Game Tournament Type Cooperative Model and Learning Motivation on Indonesian Language Learning Outcomes. *Journal of Languages and Language Teaching*, *12*(4), 1739. https://doi.org/10.33394/jollt.v12i4.12568

Alwafi, E. M. (2023). The effect of learner-generated digital materials on learners' deep learning approach and self-efficacy. *Journal of Education and E-Learning Research*, *10*(3), 415–420. https://doi.org/10.20448/jeelr.v10i3.4755

Annetta, L., Newton, M., & Schumann, K. (2025). The Intersection of Socioscientific Issues, Computation Thinking, and Design Thinking: Toward a Framework of Inquiry Driven Disruptive Pedagogy. *International Journal of Education in Mathematics, Science and Technology*, *13*(3), 791–811. https://doi.org/10.46328/ijemst.4875

Arzfi, B. P., Montessori, M., & Rusdinal, R. (2025). Development of Digital Game Based Learning Model Teaching Materials to Improve Learning Outcomes in Primary Schools. *Educational Process International Journal*, *15*(1). https://doi.org/10.22521/edupij.2025.15.114

Budiyanto, C. W., Wahyudi, M. N. A., Widiastuti, I., & Latifah, R. (t.t.). *Teaching Computational Thinking in Indonesia: Trend in Conception, Methods, Technology, and Evaluation*.

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

Chaves-Yuste, B., de-la-Peña, C., & Carrión Candel, E. (2025). Digital game-based learning: Does it improve university students' learning in an online context? *Knowledge Management & E-Learning An International Journal*, 39. https://doi.org/10.34105/j.kmel.2026.18.003

De Jesus, Â. M., & Silveira, I. F. (2021). A Collaborative Learning Framework for Computational Thinking Development through Game Programming. *Informatics in Education*. https://doi.org/10.15388/infedu.2022.14

Disman, D., Ali, M., & Syaom Barliana, M. (2017). The Use of Quantitative Research Method and Statistical Data Analysis in Dissertation: An Evaluation Study. *International Journal of Education*, *10*(1), 46. https://doi.org/10.17509/ije.v10i1.5566

Fitria, D., Asrizal, A., Dhanil, M., & Lufri, L. (2024). Impact of Blended Problem-Based Learning on Students' 21st Century Skills on Science Learning: A Meta-Analysis. *International Journal of Education in Mathematics, Science and Technology*, *12*(4), 1032–1052. https://doi.org/10.46328/ijemst.4080

Gilchrist, P. O., Alexander, A. B., Green, A. J., Sanders, F. E., Hooker, A. Q., & Reif, D. M. (2021). Development of a Pandemic Awareness STEM Outreach Curriculum: Utilizing a

Computational Thinking Taxonomy Framework. *Education Sciences*, *11*(3), 109. https://doi.org/10.3390/educsci11030109

Haviz, M., & Maris, I. M. (2018). Teaching Quantitative Research Method with Three Methods of Learning. *Al-Ta Lim Journal*, *25*(3), 234–247. https://doi.org/10.15548/jt.v25i3.394

Hu, Z. (2024). Game-Based Learning: Alternative Approaches to Teaching and Learning Strategies in Health Sciences Education. *Educational Process International Journal*, *13*(2). https://doi.org/10.22521/edupij.2024.132.6

Inayah, Z., Buchori, A., & Pramasdyahsari, A. S. (2021). *The effectiveness of PBL and PjBL assisted kahoot learning models on student learning outcomes*.

Kaya, D., Yaşar, A. Ö., Çetin, İ., & Kutluca, T. (2025). The relationship between the 21st-century skills and computational thinking skills of prospective mathematics and science teachers. *Journal of Pedagogical Research*, 1. https://doi.org/10.33902/JPR.202531498

Litualy, S. J., Serpara, H., & Wenno, E. C. (2022). The effect of Kahoot! Learning media on learning outcomes of German language students. *Journal of Education and Learning (EduLearn)*, *16*(2), 254–261. https://doi.org/10.11591/edulearn.v16i2.20458

Lu, T., & Chen, B. (2025). *Empowering Aerial Maneuver Games Through Model-Based Constrained Reinforcement Learning*. https://doi.org/10.20944/preprints202510.2280.v1

Mondal, P., & Mondal, S. (2018). Quantitative and Qualitative Research: A Mixed Method Approach In Educational Science. *International Journal of Technical Research & Science*, *3*(VII). https://doi.org/10.30780/IJTRS.V3.I7.2018.010

Muhammad, I., Rusyid, H. K., Maharani, S., & Angraini, L. M. (2023). Computational Thinking Research in Mathematics Learning in the Last Decade: A Bibliometric Review. *International Journal of Education in Mathematics, Science and Technology*, *12*(1), 178–202. https://doi.org/10.46328/ijemst.3086

Mumcu, F., Andic, B., Maricic, M., Tejera, M., & Lavicza, Z. (2025). Unpacking teachers' value beliefs about computational thinking and programming. *Journal of Educational Technology and Online Learning*, *8*(1), 41–63. https://doi.org/10.31681/jetol.1497284

Naccache, H., Altae, M., & Barham, A. (2025). Enhancing Mathematics Achievement: A Game-Based Learning Intervention in Qatar. *Educational Process International Journal*, *18*(1). https://doi.org/10.22521/edupij.2025.18.481

Pala, F. K. (2025). Examining the Relationship between Computational Thinking and Participation Styles in Instructional Discussions. *International Journal of Technology in Education*, *8*(3), 681–697. https://doi.org/10.46328/ijte.1179

Suarsana, I. M., Jupri, A., Suryadi, D., & Nurlaelah, E. (2025). *An Analysis of Mathematics Teaching and Learning Process to Enhance Computational Thinking: The Case of Straight-Line Equations*. *17*(2).

Suendarti, M., & Virgana, V. (2022). Elevating natural science learning achievement: Cooperative learning and learning interest. *Journal of Education and Learning (EduLearn)*, *16*(1), 114–120. https://doi.org/10.11591/edulearn.v16i1.20419

Thomas, U. O., Kebiru, U., Emmanuel, E. A., & Josephine, A. O. (2025). Quantitative research method in the spatial analysis of geographical phenomenon: The GIS nexus. *I-Manager's Journal on Mathematics*, *14*(1), 43. https://doi.org/10.26634/jmat.14.1.21496

Tiep, P. Q., & Thi Huong, N. (2026). Building Science Learning Environments based on Real-World Experiences and Nature for Preschool Children. *International Journal of Research in Education and Science*, *12*(1), 192–203. https://doi.org/10.46328/ijres.5169

Wahyuni, S., Arista, J., Nuha, U., & Astutik, J. (2025). Science learning module based on local potential of Grenden village on digestive system material to improve problem solving ability of junior high school students. *Jurnal Pendidikan Biologi Indonesia*, *11*(1).

Wanglang, C., Sraubon, K., & Piriyasurawong, P. (2024). Combining Game-Based Learning with Design Thinking Using Block-based Programming to Enhance Computational Thinking and Creative Game for Primary Students. *Higher Education Studies*, *14*(2), 137. https://doi.org/10.5539/hes.v14n2p137

Warsihna, J., Ramdani, Z., & Prakoso, B. H. (2019). Using Kahoot to Improve Students' Achievement and Critical Thinking in Undergraduate of Psychology Students. *Proceedings of the 16th*

International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2019), 144–150. https://doi.org/10.33965/celda2019_201911L018

Zufahmi, Z., Rohman, F., & Sari, M. S. (2025). Augmented reality in science learning: A systematic literature review. *Jurnal Pendidikan Biologi Indonesia*, *11*(1).