

WORDWALL-BASED BRAINSTORMING LEARNING MODEL: AN EXPERIMENTAL STUDY ON STUDENTS' ABILITY TO EXPRESS IDEAS AS AN INDICATOR OF ACTIVE LEARNING

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Abstract: This article aims to determine the effectiveness of applying the Wordwall interactive game-assisted brainstorming learning model in increasing student learning activity, particularly in terms of the ability to express ideas. The study used a quantitative approach with a quasi-experimental design. The research subjects were seventh-grade students at SMP Negeri 22 Bandar Lampung, who were divided into an experimental class and a control class. The instrument used was a learning activity questionnaire that had been tested for validity and reliability. Data analysis was performed through normality tests, homogeneity tests, Mann-Whitney U tests, and t-tests. The results showed a significant difference between the learning activities of students in the experimental class and the control class with a significance value of < 0.05 . Thus, the application of the Wordwall-assisted brainstorming learning model proved to be effective in increasing student learning activeness, especially in terms of courage and fluency in expressing ideas. This model is relevant to be applied as an alternative to innovative learning in the context of 21st-century learning.

Keywords: Learning activeness, Brainstorming, Wordwall, Idea expression

Abstrak: artikel ini bertujuan untuk mengetahui efektivitas penerapan model pembelajaran brainstorming berbantu game interaktif Wordwall dalam meningkatkan keaktifan belajar siswa, khususnya pada indikator kemampuan mengemukakan gagasan. Penelitian menggunakan pendekatan kuantitatif dengan desain eksperimen semu (quasi experiment). Subjek penelitian adalah siswa kelas VII SMP Negeri 22 Bandar Lampung yang dibagi ke dalam kelas eksperimen dan kelas kontrol. Instrumen yang digunakan berupa angket keaktifan belajar yang telah diuji validitas dan reliabilitasnya. Analisis data dilakukan melalui uji normalitas, uji homogenitas, uji Mann-Whitney U, dan uji-

t. Hasil penelitian menunjukkan adanya perbedaan yang signifikan antara keaktifan belajar siswa pada kelas eksperimen dan kelas kontrol dengan nilai signifikansi $< 0,05$. Dengan demikian, penerapan model pembelajaran brainstorming berbantu Wordwall terbukti efektif dalam meningkatkan keaktifan belajar siswa, terutama dalam keberanian dan kelancaran mengemukakan gagasan. Model ini relevan diterapkan sebagai alternatif pembelajaran inovatif dalam konteks pembelajaran abad ke-21.

Keywords: Learning activeness, Brainstorming, Wordwall, Idea expression

INTRODUCTION

Ideally, the learning process positions students as active participants who are directly engaged in thinking, questioning, discussing, and expressing their ideas ¹. Student learning engagement serves as a critical indicator of educational success, ² because through such active engagement, students are able to construct understanding independently, sharpen their cognitive processes, and enhance their self-confidence ³. Under ideal conditions, students demonstrate the courage to express new ideas, respond to teachers' questions, and contribute opinions during discussions ⁴. Such activities reflect the achievement of learning objectives that are not solely focused on content mastery, but also on the development of communication skills, creativity, and collaborative competencies ⁵. When student learning engagement operates optimally, the classroom environment becomes dynamic and interactive, fostering the emergence of meaningful learning ⁶. Thus, active learning constitutes a fundamental element in achieving comprehensive learning outcomes ⁷.

¹ Chhaya S Gosavi and Sandhya Arora, "Active Learning Strategies For Engaging Students For Higher Education," no. 36 (2022): 1–7.

² Gosavi and Arora.

³ Jen-chia Chang, "A Study of Graduate Students' Achievement Motivation, Active Learning, and Active Confidence Based on Relevant Research" 13, no. June (2022): 1–10, <https://doi.org/10.3389/fpsyg.2022.915770>.

⁴ Chang.

⁵ Chang.

⁶ Elsa Ribeiro-silva, Catarina Amorim, and José Luis Aparicio-herguedas, "Trends of Active Learning in Higher Education and Students' Well-Being: A Literature Review" 13, no. April (2022): 1–10, <https://doi.org/10.3389/fpsyg.2022.844236>.

⁷ Omarbek Nurbavliyev, Serkan Kaymak, and Bakhyt Sydykov, "The Effect Of Active Learning Method On Students' Academic Success, Motivation And Attitude Towards Mathematics," *JOURNAL OF LANGUAGE AND LINGUISTIC STUDIES* 18, no. 2 (2022): 701–13.

However, empirical classroom realities indicate that students' learning activeness remains far below the expected level⁸. Classroom instruction remains predominantly dominated by monotonous lecture-based methods, resulting in students' passive participation and their limited engagement in higher-order cognitive processes⁹. This situation results in students' limited ability to articulate ideas, which constitutes one of the primary indicators of active learning¹⁰. Many students experience low self-confidence, are not accustomed to engaging in academic discussions, and are apprehensive about making mistakes when expressing their opinions.¹¹ Moreover, the instructional media employed by teachers tend to be limited, thereby failing to optimally stimulate students' active participation in the learning process¹². As a result, the learning process fails to be interactive, and students are provided with very limited opportunities to practice and develop critical thinking skills¹³. This condition underscores the urgent need for instructional innovation capable of fostering students' confidence, creativity, and active participation¹⁴.

One relevant solution to address these challenges is the implementation of a Wordwall-assisted brainstorming learning model¹⁵. Brainstorming is an instructional model that encourages students to generate and express as many ideas as possible without fear of making mistakes, thereby making it particularly effective in fostering active learning¹⁶. When integrated with the digital platform Wordwall, the

⁸ Beyan Kedir Obsa and Eba Mijena Negero, "Opportunities And Chalanges In Implementing Active Learning Methods In English Language Teaching The Case Of Grade II Government Secondary Schools In Bole Sub City Addi Ababa," 2025.

⁹ Peter J Woods and Y Copur-gencturk, "Examining the Role of Student-Centered versus Teacher-Centered Pedagogical Approaches to Self-Directed Learning through Teaching," *Teaching and Teacher Education* 138, no. March 2023 (2024): 104415, <https://doi.org/10.1016/j.tate.2023.104415>.

¹⁰ Cihan University-erbil and Israa B Azeez, "Oral Participation in Class , Problems , and Solutions : A Case Study of the English Department At," *Cihan University-Erbil Journal of Humanities and Social Sciences* 7, no. 1 (2023): 126–31, <https://doi.org/10.24086/cuejhss.vol7n1y2023.pp>.

¹¹ Woods and Copur-gencturk, "Examining the Role of Student-Centered versus Teacher-Centered Pedagogical Approaches to Self-Directed Learning through Teaching."

¹² Woods and Copur-gencturk.

¹³ Ji Busa and Sun-joo Chung, "Education Sciences The Effects of Teacher-Centered and Student-Centered Approaches in TOEIC Reading Instruction," *Ji Busa and Sun-Joo Chung*, 2024.

¹⁴ Woods and Copur-gencturk, "Examining the Role of Student-Centered versus Teacher-Centered Pedagogical Approaches to Self-Directed Learning through Teaching."

¹⁵ Isabel Coryunitha Panis et al., "Gamification-Based Learning Design with Wordwall to Improve Learning Activities and Learning Outcomes," *Journal of Education Technology* 9, no. 2 (2025): 271–79.

¹⁶ Ida Ayu Made Sri Widiasturi, Ni Made Wersi Murtini, and Ruli Anto, "Jurnal Pendidikan Progresif Brainstorming as an Effective Learning Strategy to Promote Students '," *Jurnal Pendidikan Progresif* 12, no. 2 (2022): 960–71, <https://doi.org/10.23960/jpp.v12.i2>.

brainstorming process becomes more engaging, as students are able to visualize ideas, interact with educational games, and respond to questions promptly¹⁷. Wordwall menyediakan berbagai template seperti *matching*, *spinner*, *gameshow quiz*, dan *group sort* yang dapat merangsang siswa berpartisipasi aktif¹⁸. The integration of brainstorming and Wordwall not only enhances student engagement but also fosters a learning environment that is both enjoyable and intellectually stimulating¹⁹. Accordingly, this model has the potential to significantly strengthen indicators of students' learning activeness, particularly in the aspect of articulating and expressing ideas²⁰.

Several previous studies have demonstrated that the brainstorming method is effective in enhancing students' creativity, confidence in expressing opinions, and the quality of their interactions during classroom discussions²¹. Likewise, numerous studies have reported that the use of Wordwall as an instructional medium has been empirically proven to enhance students' motivation, participation, and conceptual understanding through game-based learning activities²². However, there remains a paucity of studies that specifically integrate these two approaches into a cohesive and comprehensive instructional design²³. Moreover, previous studies have predominantly focused on improving learning outcomes or student motivation rather than on the specific indicator of students' active engagement in expressing ideas. This gap constitutes the core issue addressed by the present study. The novelty of this research lies in the structured integration of the Brainstorming learning model with the Wordwall digital medium to enhance students' learning activeness, particularly their

¹⁷ Syarifah Aeni Rahman, "The Effect of Wordwall Digital Game Media on Improving Students' Learning Outcomes and Communication Skills in Social Studies at Elementary School," *Harmoni Sosial: Jurnal Pendidikan IPS* 12, no. 2 (2025): 138–52.

¹⁸ Panis et al., "Gamification-Based Learning Design with Wordwall to Improve Learning Activities and Learning Outcomes."

¹⁹ Intan Yusrina Zairon, Tengku Siti, and Meriam Tengku, "Adaptive Gami Fi Cation in Collaborative Virtual Classroom : A Systematic Review," *Peer J*, 2025, <https://doi.org/10.7717/peerj-cs.3146>.

²⁰ Panis et al., "Gamification-Based Learning Design with Wordwall to Improve Learning Activities and Learning Outcomes."

²¹ Lapshina N V Master and Senior Lecturer, "Brainstorming' As An Effective Way To Improve Communication Skills Of Students Of Non-Linguistic Specialties," *ПЕДАГОГИЧЕСКИЕ НАУКИ*, 2022, 150–58.

²² Martin Kustati et al., "Submitted: August 26," *JOURNAL OF HUMANITIES AND SOCIAL STUDIES* 2, no. 4 (2024): 1435–42.

²³ Diana Margarita et al., "Active Learning Strategies in Computer Science Education : A Systematic Review," *MDPI*, 2024.

ability to articulate ideas, within the context of Islamic Religious Education (PAI) as well as other subject areas.

This study is of high urgency, as learning activeness constitutes a fundamental prerequisite for 21st-century education, which emphasizes creativity, communication, and collaboration. Students who demonstrate low levels of engagement tend to experience difficulties in developing critical thinking skills and are less capable of articulating their ideas in both academic and social contexts. Through the implementation of the Wordwall-assisted Brainstorming model, teachers are able to create a more innovative and enjoyable learning environment that effectively encourages students' full engagement in the learning process. Furthermore, this study provides practical contributions for educators by offering an alternative instructional model that has been empirically proven to significantly enhance students' learning activeness. From a theoretical perspective, this research enriches the existing body of literature on the integration of digital technology with active learning strategies. Therefore, this study is essential for improving the overall quality of instruction and for creating opportunities for students to develop greater confidence in expressing their ideas.

METHODE

This study employed a quantitative approach using a quasi-experimental research design. The research was conducted at SMP Negeri 22 Bandar Lampung during the odd semester of the current academic year, with seventh-grade students serving as the research participants. The participants were divided into two groups: an experimental group that implemented the brainstorming learning model supported by the interactive game-based application Wordwall, and a control group that employed conventional instructional methods. The initial phase of the study involved the development of a learning activeness questionnaire, with particular emphasis on the focal indicator of the study, namely students' ability to articulate ideas. Prior to the main data collection, the instrument underwent validity and reliability testing to ensure its suitability for measuring students' learning activeness.

The instrument trial was conducted with 32 students outside the research sample to assess the adequacy of the questionnaire items. Of the 15 items developed, 10 items were deemed valid based on the results of the Product Moment correlation analysis, while 3 items were discarded due to r -values lower than the critical r -table threshold. Furthermore, the instrument's reliability was examined using Cronbach's Alpha²⁴, yielding a coefficient of 0.872, which indicates very high reliability. This result confirms that the instrument is sufficiently reliable for measuring students' learning activeness, particularly in terms of their ability to express ideas. The research was conducted through three stages: pre-research, implementation, and post-research. During the pre-research stage, the researcher prepared instructional materials, research instruments, and coordinated with the school authorities. The implementation stage involved administering the treatment over four instructional sessions, in which the experimental group was taught using the brainstorming learning model supported by the Wordwall interactive platform, while the control group continued to receive conventional lecture-based instruction. Data were collected through a learning activeness questionnaire administered after the completion of the treatment. In the post-research stage, the collected data were analyzed using normality tests, homogeneity tests, and independent samples t -tests to evaluate the effectiveness of the intervention. The results of these analyses served as the basis for drawing conclusions regarding the effectiveness of the Wordwall-assisted brainstorming model in enhancing students' learning activeness, particularly in terms of their ability to articulate ideas.

RESULTS

A. Normality Test

The normality test was conducted to determine whether the collected data followed a normal distribution. The data were considered to be normally distributed when the significance value exceeded 0.05. The results of the normality test in this study are presented as follows:

²⁴ Cronbach, L. J. *Coefficient alpha and the internal structure of tests*. *Psychometrika*, 16(3), (1951). 297–334.

Tests of Normality							
	Kelompok	Kolmogorov-Smirnov ^a			Shapiro-Wilk		Sig. .
		Statistic	df	Sig.	Statistic	df	
Data	1.00	.239	32	.000	.898	32	.006
	2.00	.129	31	.200*	.979	31	.787

a. Lilliefors Significance Correction

Tabel 1. Tests of Normality

Based on the results of the normality test presented in the *Tests of Normality* table, Group 1 obtained a Kolmogorov–Smirnov significance value of 0.000 and a Shapiro–Wilk significance value of 0.006, both of which are below the 0.05 threshold. These results indicate that the data distribution in Group 1 does not follow a normal distribution. In contrast, Group 2 showed a Kolmogorov–Smirnov significance value of 0.200 and a Shapiro–Wilk significance value of 0.787, both exceeding the 0.05 level. Therefore, the data in Group 2 can be considered normally distributed. Overall, these findings demonstrate that only Group 2 satisfies the assumption of normality, whereas Group 1 does not meet this assumption.

B. Uji *Mann-Whitney U*

Test Statistics ^a	
	Data
Mann-Whitney U	316.500
Wilcoxon W	844.500
Z	-2.474
Asymp. Sig. (2-tailed)	.013

a. Grouping Variable: Kelompok

Tabel 2. Test Statistics

Based on the results of the Mann–Whitney U test presented in the Test Statistics table, the U value was 316.500 and the W value was 844.500, with a Z score of -2.474 . The Asymp. Sig. (2-tailed) value was 0.013, which is lower than the 0.05 significance level. Therefore, it can be concluded that there is a statistically significant difference between the two groups being compared. These findings

indicate that the observed difference is not attributable to random chance, but rather reflects a genuine difference in the data between the two groups.

C. Homogeneity Test

		Levene Statistic	df1	df2	Sig.
Data	Based on Mean	33.951	1	61	.000
	Based on Median	10.256	1	61	.002
	Based on Median and with adjusted df	10.256	1	39.639	.003
	Based on trimmed mean	33.210	1	61	.000

Tabel 3. Tests of Homogeneity of Variances

Based on the Tests of Homogeneity of Variances, all Levene's Test results—calculated using the mean, median, median with adjusted degrees of freedom, and trimmed mean—yielded significance values < 0.05, namely: mean 33.951 (0.000), median 10.256 (0.002), median with adjusted degrees of freedom 10.256 (0.003), and trimmed mean 33.210 (0.000). These findings indicate that the variances between groups are not homogeneous; therefore, the assumption of homogeneity of variances was not satisfied.

D. Test T

Levene's Test for Equality of Variances		t-test for Equality of Means								
F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference			
							Lower	Upper		
Equal variances assumed	.000	33.951	61	-3.153	61	.003	-	1.24256	-6.40198	-1.43269
Equal variances not assumed				-3.185	44.361	.003	-	1.22983	-6.39533	-1.43935

Tabel 4. Independent Samples Test

The results of the t-test indicate that the null hypothesis (H_0) was rejected, demonstrating a statistically significant difference between the mean scores of the two groups. Under both the equal-variance and unequal-variance assumptions, the test yielded a p-value of 0.003, which is substantially lower than the conventional significance threshold of 0.05. Accordingly, it can be concluded that the observed difference between the two groups is statistically significant.

The analysis of the questionnaire data indicates that the Wordwall-assisted brainstorming learning model is effective in enhancing students' learning activeness, particularly with regard to the indicator of idea expression.²⁵ This improvement is evidenced by the increasing number of students actively participating in expressing ideas, opinions, and responses throughout the learning process²⁶. Brainstorming provides students with an open space to express ideas freely without the pressure of right-wrong judgments, while Wordwall creates a learning atmosphere that is engaging, visually rich, and highly interactive²⁷. The integration of both approaches enables students to express their ideas more confidently, as the classroom atmosphere becomes less rigid, more communicative, and substantially removed from a tense or anxiety-inducing learning environment²⁸. This condition directly led to a significant improvement in the indicator of students' ability to articulate ideas; therefore, the alternative hypothesis (H_1) was accepted.

The brainstorming model is effective because it incorporates mechanisms that encourage students to think rapidly and generate spontaneous ideas.²⁹ At this stage, the teacher stimulates students through guiding questions, key terms, or

²⁵ Himendra Balalle, "Social Sciences & Humanities Open Exploring Student Engagement in Technology-Based Education in Relation to Gamification, Online / Distance Learning, and Other Factors: A Systematic Literature Review," *Social Sciences & Humanities Open* 9, no. February (2024): 100870, <https://doi.org/10.1016/j.ssaho.2024.100870>.

²⁶ Daniel Ari Widhiatama and Catharina Brameswari, "The Effectiveness of Wordwall in Enhancing Students' Engagement and Motivation in Literature Classes," *International Journal of Linguistics, Literature and Translation* 0299 (2024): 15–24, <https://doi.org/10.32996/ijllt>.

²⁷ Intisar Zakariya and Ahmed Ibrahim, "Optimizing Communication Competence in ELF Learners via Brainstorming Methods (A Study at Qassim University)," *Journal of Arts, Literature, Humanities, And Social Science* 120 (2025): 343–54.

²⁸ Nur Dahniar, "Enhancing English Learning Outcomes with Joyful Learning-," *Journal of Research Trends in Social Sciences and Humanities* 4, no. 1 (2025): 95–104.

²⁹ Michael Muller et al., "Group Brainstorming with an AI Agent: Creating and Selecting Ideas," 2024.

contextual problems, after which students are encouraged to generate as many ideas as possible³⁰. This structure fosters students' courage, enhances cognitive fluency, and strengthens their ability to articulate ideas verbally³¹. When integrated with Wordwall, brainstorming is transformed from a conventional discussion activity into a challenging and highly interactive learning game.³² Students are encouraged to express their ideas due to the presence of rewards, scoring mechanisms, and time-based challenges, which consequently lead to faster and more diverse student responses³³. This process strongly supports the indicator of idea articulation, which requires courage, spontaneity, and verbal fluency.

Wordwall offers visually engaging features, such as random wheels, match-up activities, anagrams, quizzes, and open-the-box games, which are highly effective in capturing students' attention and fostering their enthusiasm for learning³⁴. This media creates an enjoyable classroom atmosphere, thereby significantly reducing students' psychological barriers, such as shyness, fear of making mistakes, and lack of self-confidence³⁵. When Wordwall presents specific questions or visual prompts, students are encouraged to generate ideas because the learning activity is perceived as a form of play rather than a formal assessment³⁶. This game elicits rapid responses, fosters spontaneous confidence, and generates diverse ideas, thereby naturally enhancing the indicator of students'

³⁰ Cenk Akay, "The Impact of Brainstorming Technique on Academic Achievement and Creative Thinking: A Meta-Analysis Study," *Journal Sagepub*, no. September (2025): 1–21, <https://doi.org/10.1177/21582440251378562>.

³¹ Hapri Octarina, Syamsul Rizal, and Fera Zasrianita, "The Use Of Brainstorming Strategy To Improve Students' Speaking Ability," *Jadila: Journal of Development and Innovation in Language and Literature Education* 2, no. 2 (2021): 212–23.

³² Jurnal Riset and Hots Pendidikan, "Enhancing Student Learning Motivation Throught Wordwall Educational Games In Mathematics," *Jurnal Riset HOTS Pendidikan Matematika* 5, no. August (2025): 1201–12.

³³ Kuo-wei Lee, "Heliyon Effectiveness of Gamification and Selection of Appropriate Teaching Methods of Creativity: Students' Perspectives," *Heliyon* 9, no. 10 (2023): e20420, <https://doi.org/10.1016/j.heliyon.2023.e20420>.

³⁴ Kustati et al., "Submitted: August 26."

³⁵ Zakiyah Bz et al., "MANAGERE : Indonesian Journal of Educational Management Gamification-Based Emotional Connectivity Model : Strengthening Positive Classroom Relationships to Reduce Student Academic Burnout," *MANAGERE: Indonesian Journal of Educational Management* 7, no. 4 (2025): 362–75.

³⁶ Kexin Zhang et al., "Effects of Gamification on Learning Outcomes , Satisfaction , Engagement , and Motivation in Virtual Learning Environments Between 2020 and 2022," *International Journal of Online Pedagogy and Course Design* 12, no. 1 (2022): 573–75, <https://doi.org/10.4018/IJOPCD.306684>.

ability to articulate ideas³⁷. Thus, Wordwall serves as an effective visual and emotional stimulus in fostering students' confidence and willingness to express their opinions.

The findings of this study are consistent with previous research. A study conducted by Prabowo³⁸ demonstrates that the brainstorming model significantly enhances students' ability to articulate their opinions by fostering a discussion environment that is safe, open, and conducive to active participation. The study conducted by Taryzca³⁹ found that the Wordwall learning media significantly enhanced students' learning activeness and verbal interaction due to its interactive and competitive characteristics. Furthermore, a study conducted by Khasanah⁴⁰ concluding that digital game-based learning can effectively foster students' creativity and enhance their confidence in articulating ideas. Sumirah's study further supports this finding⁴¹. The results of this study indicate that the brainstorming method is an instructional approach capable of enhancing students' learning activity. This is evidenced by its greater emphasis on students' expression of opinions and ideas, as well as its interactive nature, which allows students to freely articulate their thoughts. Likewise, teachers demonstrated a thorough understanding of the implementation and advantages of the brainstorming method. The findings of this study further reinforce these observations, as the integration of brainstorming with the Wordwall platform proved effective in

³⁷ Muhammad Iqbal, Al Ghozali, and Sofyan Mustoip, "The Role of Gamification Methods in Increasing Creativity and Innovation of Elementary School Students in the Digital Era The Role of Gamification Methods in Increasing Creativity And," *Journal of Primary School* 1, no. 2 (2024): 21–27.

³⁸ Anggun Taqiyuddin Prabowo and Universitas Yudharta Pasuruan, "Brainstorming Pada Mata Pelajaran Pai Di Smk Pgri Pandaan – Pasuruan," *MODELING: Jurnal ...* 10 (2023): 301–11, <http://www.jurnal.stitnualhikmah.ac.id/index.php/modeling/article/view/1750%0Ahttp://www.jurnal.stitnualhikmah.ac.id/index.php/modeling/article/download/1750/1000>.

³⁹ Taryzca Putri Laela Ramadhani et al., "Efektivitas Penggunaan Media Pembelajaran Wordwall Untuk Meningkatkan Motivasi Belajar IPAS," *RISOMA: Jurnal Riset Sosial Humaniora Dan Pendidikan* 3, no. 1 (2024): 108–15, <https://doi.org/10.62383/risoma.v3i1.539>.

⁴⁰ Lutfiana Khasanah and Muh. Ihsan, "Pengaruh Penggunaan Media Digital Wordwall Terhadap Peningkatan Keaktifan Belajar Pendidikan Agama Islam Peserta Pendahuluan Pengaruh Merupakan Kemampuan Yang Dapat Menyebabkan Perubahan Atau Memberikan," *Jurnal Penelitian Pendidikan Islam* 3, no. 2 (2025): 68–79.

⁴¹ satya wiranata Sumirah and zawaqi afdal Jamil, "Metode Brainstorming Dalam Meningkatkan Keaktifan Belajar Siswa Madrasah Aliyah Negeri 1 Kota Sungai Penuh Di Provinsi Jambi," *Syntax Literate: Jurnal Ilmiah Indonesia* 17, no. 2 (2024): 123–30.

encouraging students to actively share opinions and generate creative ideas during the learning process.

The effectiveness of Wordwall-based brainstorming in enhancing students' ability to express ideas is also influenced by the teacher's classroom management skills. Teachers who provide appreciation for every idea, foster a healthy competitive atmosphere, and deliver engaging stimuli through Wordwall succeed in creating a learning environment that encourages students to speak up. Moreover, in heterogeneous classrooms, this model allows typically reserved students to participate, as the activities are non-intimidating. Students are only required to respond to Wordwall displays or react to ideas generated during brainstorming. These contextual factors make students feel more comfortable and motivated to actively express their ideas, thereby improving learning outcomes.

The novelty of this study lies in the integration of the brainstorming model with the digital platform Wordwall to enhance a highly specific indicator of learning activeness, namely students' ability to articulate ideas. Previous studies have predominantly focused on the use of Wordwall to improve motivation or conceptual understanding; however, limited research has combined it with brainstorming strategies to maximize students' verbal participation. This study offers a novel contribution by demonstrating that Wordwall is not only effective as an assessment tool or quiz-based game, but also serves as a medium that enriches classroom discussions and stimulates students' creative ideas. Furthermore, this research emphasizes that students' learning activeness can be enhanced through interactive digital approaches without compromising the pedagogical essence of brainstorming itself. Consequently, this study provides a significant contribution to 21st-century educational innovation by integrating creative thinking methodologies with interactive digital media.

CONCLUSION

Based on the research findings, it can be concluded that the implementation of the Wordwall-based Brainstorming learning model significantly enhances students' learning activeness, particularly in the indicator of their ability to articulate ideas, as evidenced by the significant differences between the experimental and control groups.

These findings theoretically reinforce the notion that integrating active learning strategies with interactive digital media can foster a more participatory learning environment, while also offering a practical contribution in the form of an effective alternative instructional model for teachers to encourage students' confidence in expressing their ideas. This study also has limitations regarding the data distribution, which was not entirely normal, and the variance, which was not homogeneous. Therefore, further research is recommended with a larger sample size, a longer treatment duration, and additional variables such as critical thinking or communication skills. Overall, this study provides a significant contribution to the field of educational research by offering empirical evidence that the combination of brainstorming and Wordwall can serve as an innovative teaching approach relevant to the 21st-century learning context. It can also serve as a valuable reference for both researchers and practitioners seeking to enhance student engagement through a more creative, collaborative, and technology-based approach.

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