Available online at: http://journal.uinsgd.ac.id/index.php/al-aulad
Al-Aulad: Journal of Islamic Primary Education, 9 (1), 2026, 23-35

p-ISSN: 2615-5605
e-ISSN: 2620-5238

DEVELOPING WEB-BASED INTERACTIVE LEARNING MEDIA: IMPROVING STUDENT ENGAGEMENT IN NATURAL AND SOCIAL SCIENCES AT MADRASAH IBTIDAIYAH

Ulfatun Nadhiroh[1], Nur Cholid[2], Fitria Martanti[3] dan Nurul Asima[3]
[1,2,3] Department of Madrasah Ibtidaiyah Teacher Education, Faculty of Islamic Religion, Universitas Wahid Hasyim, Indonesia
[4] CLC Ladang Lambir, Malaysia
fitriamartanti@unwahas.ac.id

Received: February, 2026, Accepted: March, 2026, Published: March, 2026

ABSTRACT
The urgency of developing web-based interactive media wordwalls is urgently needed to provide interactive, contextual learning according to the needs of students in the digital era. The purpose of this study is to analyze the needs for the development of Natural and Social Sciences learning media and to assess the feasibility of the developed media. This type of research is R&D (Research and Development). The object of research in this study is the web-based interactive learning media Wordwall in the science subject of class IV, which is examined from the aspects of feasibility, validity, practicality, and effectiveness of its use in improving the quality of learning. The research subjects in this study are teachers and grade IV students at Madrasah Ibtidaiyah Negeri Semarang City, who are involved in the stage of needs analysis, limited trials, and response to the use of media. The procedure in this research and development applies the Sugiyono development model procedure, which is only carried out until the sixth stage. Data collection was carried out by conducting observations, interviews, questionnaires and documentation. The data analysis technique in this study uses qualitative and quantitative descriptive analysis techniques through questionnaires of the needs of educators, students, media experts and material experts. The results of the study show that the Wordwall-Based Interactive Learning media for Natural and Social Sciences Class IV Madrasah Ibtidaiyah Negeri Semarang City is very valid to be tested on students. The validation results from media experts obtained a score of 50, an average score of 5.0, and a validity of 100%. Meanwhile, the subject matter experts obtained a score of 48, an average score of 4.8, and a validity of 96%. The results of the analysis showed that the interactive media based on the web word wall of the Natural and Social Sciences subject was very valid.
Keywords*: Natural and Social Sciences, learning media, website*

ABSTRAK
Urgensi pengembangan media interaktif berbasis web wordwall sangat dibutuhkan untuk menghadirkan pembelajaran yang interaktif, kontekstual dan sesuai kebutuhan siswa di era digital. Tujuan dari penelitian ini adalah untuk mengetahui analisis kebutuhan pengembangan media pembelajaran Ilmu Pengetahuan Alam dan Sosial serta mengkaji kelayakan media yang dikembangkan. Jenis penelitian ini adalah penelitian pengembangan R&D (Research and Development). Objek penelitian dalam penelitian ini adalah media pembelajaran interaktif berbasis web wordwall pada mata pelajaran IPAS kelas IV yang dikaji dari aspek kelayakan, kevalidan, kepraktisan, serta efektivitas penggunaannya dalam meningkatkan kualitas pembelajaran. Subjek

penelitian dalam penelitian ini adalah guru dan peserta didik kelas IV di Madrasah Ibtidaiyah Negeri Kota Semarang, yang terlibat dalam tahap analisis kebutuhan, uji coba terbatas, serta pemberian respons terhadap penggunaan media.Prosedur dalam penelitian dan pengembangan ini menerapkan prosedur model pengembangan Sugiyono yang hanya dilakukan hingga tahap keenam. Pengumpulan data dilakukan dengan mengadakan pengamatan, wawancara, angket dan dokumentasi. Teknik analisis data pada penelitian ini menggunakan teknik analisis deskriptif kualitatif dan kuantitatif melalui angket kebutuhan pendidik, peserta didik, ahli media dan ahli materi. Hasil penelitian menunjukkan bahwa media Pembelajaran Interaktif Berbasis Web Wordwall Mata Pelajaran Ilmu Pengetahuan Alam dan Sosial Kelas IV Madrasah Ibtidaiyah Negeri Kota Semarang sangat valid untuk diujicobakan kepada peserta didik. Hasil validasi dari ahli media memperoleh skor 50, nilai rata-rata 5,0, dan memperoleh kevalidan sebesar 100%. Sedangkan ahli materi memperoleh skor 48, nilai rata-rata 4,8, dan memperoleh kevalidan sebesar 96%. Hasil analisis menunjukkan media interaktif berbasis web word wall mata pelajaran IPAS sangat valid.
Kata Kunci*: Ilmu Pengetahuan Alam dan Sosial, media pembelajaran, website*

1. Introduction

The development of information and communication technology in the digital era has brought significant transformation in the world of education. The integration of technology into the learning process is no longer just a complement; it has become a strategic need to improve the quality and effectiveness of learning. At the basic education level, especially in Madrasah Ibtidaiyah (Islamic elementary school), innovation in learning media is an important factor in creating engaging, meaningful content that aligns with the characteristics of digital-generation students (Umami et al., 2025, Fadilla & Junaidi, 2025). However, in practice, teaching often relies on teacher-centered and conventional methods, with limited and less interactive media use. This can lower student motivation and hinder understanding of abstract material, making the benefits of interactive media, such as engagement, feedback, and hands-on exploration, especially important.

Web-based interactive learning media is one of the alternative solutions relevant to the learning needs of the 21st century. These media enable the integration of various multimedia elements, such as text, images, animations, videos, interactive quizzes, and simulations, into a single, easily accessible platform (Muskhir et al., 2023). The main advantages of web-based media lie in the flexibility of access, ease of content updates, and its ability to create more participatory and student-centered learning. (Sujarwo et al., 2022, Sembiring et al., 2024). With a responsive and interactive design, students can learn independently and collaboratively, both inside and outside the classroom.

The selection of Wordwall's web-based interactive learning media was motivated by the need to make Natural and Social Sciences learning more interesting and participatory, especially for elementary school students who are visual learners and enjoy game-based activities. Compared to conventional media, Wordwall offers clear advantages: it increases student engagement through interactive elements, provides instant feedback, offers varied question formats, and allows easy, anytime access for students. These features encourage more active and independent learning. Furthermore, analysis of students' initial abilities shows that understanding of Natural and Social Sciences concepts is diverse and often weak for abstract topics; therefore, media that concretize concepts and boost participation are essential.

The subject of Natural and Social Sciences requires both conceptual understanding and comprehension of contextual links between natural phenomena and social life. Natural and Social Sciences explore living things, inanimate objects, their interactions, and human life within the environment. This education supports the graduate profile as the ideal for

Indonesian students. It helps students develop curiosity about surrounding phenomena. Scientific methodology in this subject foster's curiosity, critical thinking, analytical skills, and the ability to draw conclusions, all of which contribute to student wisdom. Natural and Social Sciences aims to develop not just factual knowledge but also critical thinking, problem-solving, and practical application of concepts.

The development of web-based learning media in Natural and Social Sciences subjects at Madrasah Ibtidaiyah is important to address various media learning challenges and to systematically design media that, in accordance with previous research, strengthen concept understanding and foster interest in learning (Budiarti & Triyono, 2017, Aliyah, et al., 2020, Khamparia & Pandey, 2017). In addition, the use of this media can also support teachers in managing more varied and innovative learning.

Research on the development of interactive digital-based learning media has been extensively conducted and has demonstrated positive impacts on elementary school student engagement and learning outcomes. However, there are still limitations in the development of integrated web-based media specifically for Natural and Social Sciences subjects in Islamic Elementary Schools. Research by Haleem et al. (2022) confirms that web-based technology can improve learning effectiveness through more flexible and student-centered interactions, but its implementation in Islamic elementary schools is still minimal. Meanwhile, research by Akrim et al. (2021) shows that interactive digital learning media can increase student learning motivation, but its development focuses more on general subjects and has not integrated the characteristics of Science learning in Islamic Elementary Schools. Furthermore, a study by Sailer and Homner (2020) also found that the use of interactive web-based digital media effectively increases student engagement. However, there is limited research developing web-based media that is adaptive, interactive, and tailored to the needs of Islamic Elementary School students. Therefore, the research gap in this study lies in the need to develop web-based interactive learning media that is specifically designed for science learning in elementary madrasas to support 21st-century learning that is more contextual, flexible, and student-centered.

This article aims to analyze the needs for developing Natural and Social Sciences learning media. It also examines the feasibility of the developed media. It is hoped that this development will contribute to improving the quality of learning in Natural and Social Sciences at the madrasah-based basic education level.

2. Method

The research method used is the Research and Development (R&D) method. This method is used to create certain products and to test the feasibility of the products produced. Research and Development (R&D) is the process or set of steps involved in developing a new product or improving an existing one. The resulting product is not always objects or hardware that exists in the institution, such as books, modules, teaching aids, but can also be software, such as computer programs for data processing, classroom teaching, libraries or laboratories, training, evaluation, and management. In this study, the R&D model used is the Sugiyono model, which is structured in five stages. These stages are carried out sequentially, beginning with (1) potentials and problems, followed by (2) data collection, (3) product design, (4) design validation, and concluding with (5) design review.

The research begins with the identification of potentials and problems. Potential is interpreted as something that can provide added value if developed, while a problem is a gap between expectations and reality on the ground. After clearly identifying the potentials and problems, the researcher proceeds to collect relevant data to use as the basis for product

planning. This data can be obtained from prior research, activity reports, and current official documents. With this foundation, the researcher then compiles a product design such as drawings, diagrams, or conceptual designsmaking it easier to evaluate and further develop in the next steps.

The next stage is design validation and revision. The prepared product design is submitted to experts for assessment of its feasibility, advantages, and weaknesses. This validation process aims to ensure that the developed products meet established needs and standards. Based on input from experts, researchers revise or improve the design to make the product more effective and suitable for testing. In the media development process, there are revisions that are carried out as an important stage after obtaining input from experts, which includes improvements in the content/material aspects, namely, improving conformity with the curriculum and the accuracy of concepts. Display/media is more about visual design, colors, layout, and Wordwall interactivity. Revisions can also include technical aspects of use to make the media more accessible and usable. After that, the product enters the limited trial stage, which involves small-scale testing to assess user response and initial effectiveness.

If a defect is still found during the limited trial, the product is revised before moving to a trial in real-world conditions. This next trial tests effectiveness in actual learning situations. The process is repeated until the product is declared feasible. The final R&D stage is mass production, when the product is proven effective and ready for broader use. In some cases, stages adapt to time and cost constraints, so not all lead to mass production.

This research was conducted at Madrasah Ibtidaiyah Negeri Semarang City and lasted one month. Data collection included observation, interviews, questionnaires, and documentation. Observation indicators cover teacher activities, student involvement, response to the media, and infrastructure. Interview indicators reflect teachers' needs, constraints, experiences, and expectations. The questionnaire addresses content, language, appearance, and usefulness. Documentation examines learning tools. Data from teachers and students analyzes media development needs, while material and media experts assess product feasibility. Data analysis uses both qualitative (interview, observation, expert feedback) and quantitative (statistical summaries of instrument and product feasibility validation) methods.

3. Results and Discussions

3.1 Results

Based on the needs analysis, teachers and students at Madrasah Ibtidaiyah Negeri Semarang City have never used learning media in the subject of Natural and Social Science Education. The results of the educator needs analysis showed a score of 100%, which places them in the "urgently needed" category with a criterion of 81-100%. So far, learning still relies on lecture methods and LKS/package books. This leads to a lack of student involvement in the learning process. Therefore, there is a need for more interesting and easy-to-use learning media. One example is the interactive media of Web Wordwall. Wordwall offers customizable interactive activities such as quizzes, word matches, and games, allowing students to engage directly with the lesson content. This interactivity is intended to deepen understanding by encouraging active participation. The use of easy-to-understand language is also important for this medium. It ensures that students can easily grasp the core of the material being conveyed. The use of web-based interactive learning media, such as Wordwall, as a learning tool aligns with the theory of media benefits. This theory states that the media can attract students' attention and increase learning motivation. In Natural and

Social Sciences learning, media is very important, because it can help present material more concretely, and in an interesting, easy-to-understand way for students, especially for abstract concepts.

The development of this media is also motivated by the limited use of learning media in schools. Currently, learning relies heavily on textbooks or LKS. Therefore, innovation is needed to support a more effective and interactive learning process. As a solution, Wordwall Media was developed to improve the quality of learning. The media design can be seen in the following image.

Figure 1 Media Design

Developing interactive web-based learning media for Natural and Social Sciences can increase student engagement and understanding. Drawing on learning theories and prior research, this medium aims to solve conventional, less engaging learning problems and make students more active.

The validation process in this research involves several steps. First, material experts review and evaluate the content of the web-based learning media for the Natural and Social Sciences subject at Madrasah Ibtidaiyah Negeri Semarang City. Next, media design experts assess the web interface and usability. The findings and feedback from both groups form the basis for the final assessment of the media's effectiveness.

3.1.1 Media Expert Validation Analysis

Validation by media experts showed that the developed web-based Wordwall interactive learning media achieved a very high validity score of 100%, indicating it is worthy of use. The Wordwall media for Plant Breeding features attractive color schemes, images, and themes appropriate for students' developmental stages. Details based on the media validation analysis instrument are shown in Table 1 below:

Table 1. Media Expert Validation

No	Statement	Score
1	Color and aesthetic suitability	5
2	Neatness and consistency of the layout	5
3	Clarity of icons, buttons, and text	5
4	Fit of the design with the age and characteristics of the student	5
5	Availability of supporting images/animations of the material	5
6	Button/feature functions run as commanded	5
7	Navigation between pages/interaction logic works well	5
8	The media does not experience errors while running	5
9	Optimal access speed and response time	5
10	Media interactivity makes it easier to understand material	5
	Total Score	50
	Presentase	100%

Based on Table 1, it can be seen that the validation of media experts is assessed from the appearance aspect and the programming aspect, the display aspect can be seen from The suitability of color and aesthetics obtained an excellent assessment; The neatness and consistency of the layout obtained an Excellent assessment; The suitability of the clarity of icons, buttons, and text used in the media was Excellent; The suitability of the design with the age and characteristics of the students obtained an Excellent assessment; and The availability of supporting images/animations of the material obtained an Excellent rating. The assessment of media experts achieved a maximum score of 100%. In this regard, it can be concluded that the display is highly suitable for use in the web-based interactive learning media wordwall in the Natural and Social Sciences Class IV subject, as it aligns with the indicators and the principles of accuracy and attractiveness.

This shows that the developed interactive learning media follow the principles of instructional design, emphasizing clarity, simplicity, and visual appeal. A good display of learning media increases students' attention, interest, and motivation by using appropriate and attractive visual elements. Thus, web-based wordwall media in the subject of Natural and Social Sciences grade IV can be considered valid in appearance because it meets technical indicators and aligns with the theory of visual design integration in learning.

The programming aspect can be seen from: the buttons/features function properly, receiving an Excellent score; navigation and interaction logic also received an Excellent score; the media did not produce errors when executed, earning an Excellent score; access speed and response time were rated excellent; media interactivity facilitated understanding, also achieving an Excellent score. Therefore, the programming is highly valid for use in the web-based interactive learning media wordwall for the Natural and Social Sciences class IV subject, as it meets accuracy indicators and achieves the intended results.

This shows that the quality of multimedia learning programs is determined by system reliability (the stability and consistent performance of the software), regular navigation (the structured way users move between content), and interactivity (user engagement features such as quizzes or clickable elements), which make it easier for users to understand the material through accurate, interactive programming. Students understand the material more easily because the media not only present information but also provide a learning experience that involves active participation. Therefore, the developed media can be considered programmatically valid because they adhere to the principles of usability (ease of use) and interactivity in the development of learning multimedia.

3.1.2 Subject Matter Expert Validation Analysis

A material assessment ensures the learning media align with targeted competencies and student characteristics. The evaluation focuses on student comprehension, the match between content and learning objectives, and the material's relevance to the curriculum.

In addition, the assessment also considers the level of attractiveness of the material in arousing students' interest and motivation to learn. Good media not only present material correctly and in accordance with the curriculum but are also able to package it attractively through visual displays, a variety of activities, and interactive elements that encourage active involvement of students. Thus, aesthetic and interactivity aspects are an important part of assessing the quality of media, as they both contribute directly to increasing student attention, curiosity, and participation during the Natural and Social Sciences learning process

Subject matter experts found the developed learning media met all feasibility criteria in content and presentation. The assessment confirms the material is aligned with learning objectives, relevant to the curriculum, and suitable for students' understanding. The media presents concepts clearly, organizing content systematically and minimizing misconceptions.

Experts also highlight the media's attractive appearance, which draws students' attention and boosts engagement. A visually appealing design with well-structured content makes learning more interactive and enjoyable. The product motivates students, encouraging participation and fostering interest in learning. Table 2 shows that the media ranks as "excellent" and is ready for classroom use.

Table 2. Subject Matter Expert Validation

No	Statement	Score
1	Alignment with Learning Outcomes and Learning Objectives	5
2	Clarity of material content	5
3	Material attractiveness	5
4	Material truth	5
5	Suitability of the material with the characteristics of the students	4
6	Suitability of the question with the material	5
7	Language fits with the student's level of comprehension	5
8	Ease of understanding material	4
9	Suitability of the media with the material used	5
10	The attractiveness of the material in fostering interest Learn students	5
	Total Score	48
	Presentase	96%

Based on Table 2: Suitability with Learning Outcomes and Objectives received an Excellent rating; Clarity of content received a very good rating; Attractiveness received a very good rating; Correctness received a very good rating; Suitability with student characteristics received a good rating; Question suitability received a very good rating; and Language conformity received an Excellent rating. Thus, the material content is highly suitable for use in the wordwall web-based interactive learning media for Natural and Social Sciences class IV.

Validation by material experts showed the wordwall web-based interactive learning media has very high validity, with a 96% validity percentage. This plant breeding media is valid for use, as the material matches the development level of grade 4 students in Semarang City. Visual media play a key role in attracting attention, focusing students, and supporting lesson content with visuals that complement the text. Thus, validation results from experts show this medium meets students' needs and supports learning goals.

3.2 Discussion

The needs analysis at Madrasah Ibtidaiyah Negeri Semarang City shows that teachers and students have not used interactive learning media in Natural and Social Sciences lessons. They rely on lectures, packaged books, and worksheets as their main learning sources. The process remains teacher-centered and does not give students enough opportunities to participate actively.

The results of the study show that wordwall-based interactive learning media in class IV science subjects are in the category of being very valid and suitable for use, both in terms of material, language, display, and graphics, so that they can be implemented in learning. This research has also gone through a limited trial on students, which shows that students respond positively in the form of increased interest in learning, activeness in participating in activities, and ease of understanding Natural and Social Sciences material that was previously considered difficult.

The success of this study is supported by several factors, including: the suitability of media with the characteristics of elementary school students who like game-based learning, an attractive and interactive visual display, direct feedback in each activity, and ease of access to web-based media. In addition, the results of observations with teachers show that previously, social studies learning tended to rely only on textbooks or worksheets, which

made learning less varied. There is a possibility that teachers are not used to using digital media, either due to limited skills or a lack of easy-to-use media references.

With wordwall, teachers appreciate its simple operation, requiring no complex skills and easy online access via a link. Students can also use it at home for practice. Features include interactive quizzes, matching games, multiple choices, random wheels, and automatic scoring, enhancing engaging and effective learning.

Developing learning media is essential, as revealed by the needs analysis among educators. Achieving a score of 100%, the educator's needs analysis falls into the “very needed” category, corresponding to a criterion range of 81–100%. Clearly, teachers regard learning media as a vital component for improving the quality of the learning process. This strong consensus highlights the critical role of learning media from the educators' perspective.

However, the limited use of learning media in the Natural and Social Sciences learning process leads to students being less actively involved in learning activities. The dominant lecture method tends to make students passive recipients of information (Haripriya et al., 2026). This condition can reduce students’ interest in learning and limit their opportunities to develop critical and exploratory thinking skills for understanding the concepts they learn. (Zeng et al., 2024).

In addition, relying solely on packaged books and worksheets limits the diversity of the learning process. Materials in text form rarely capture the attention of elementary school students, who are typically more attracted to visual and interactive activities. Therefore, innovative learning media are essential to create a more engaging and dynamic learning experience.

One effective solution for this issue is to develop web-based interactive learning media using the wordwall platform. This media aims to deliver an engaging learning experience by integrating visual elements, animations, and interactive activities that actively involve students (Midak et al., 2015, Tiagarajah et al., 2022).

Wordwall, a web-based interactive media, helps students understand Natural and Social Sciences more easily. With educational game activities, students learn and interact actively. This approach lets students both receive information and participate in the learning process.

Using simple, clear language is key for this medium. Language suited to elementary students’ development helps them grasp concepts more easily. The media is visually appealing and easy to use.

The development of interactive learning media aligns with the theory that media increase student attention and more effectively convey messages. When teachers use appropriate media, information can be received by students more clearly and easily.

Studies in educational technology show that well-designed learning media can increase students’ motivation and create a more enjoyable atmosphere, making them more interested in participating. This is crucial at the elementary level, where creative and innovative learning is essential.

In the context of learning in the Natural and Social Sciences, using wordwall-based interactive media can help students understand abstract concepts through more concrete visualizations. (Chandra et al., 2024, Adiansha et al., 2025). Materials presented through interactive activities can also help students remember information better because they are directly involved in the learning process (Arzeman et al., 2026).

In addition to increasing student understanding, interactive learning media can also help teachers deliver material more effectively. Teachers not only explain the material orally

but also use media to support the process of conveying information (Alkadri & Fauzi, 2020). Thus, learning becomes more varied and not monotonous.

The development of learning media addresses the lack of resources in schools. Needs analysis shows that Natural and Social Sciences learning media are still limited. Developing wordwall, a web-based tool, is expected to offer a flexible alternative in the learning process.

Therefore, creating web-based interactive media like wordwall for these subjects meets current needs. This tool aims to improve material delivery and boost student engagement. (Eisenmann, 2018).

This medium uses learning theories that highlight the media's role in boosting learning effectiveness. By adding visuals, interactive features, and engaging activities, learning media aim to make learning more meaningful.

Building on this foundation, the web-based interactive learning media wordwall is expected to address conventional learning problems that have traditionally been less attractive to students. By offering a more interactive, fun, and effective approach, this media can help improve students' understanding of Natural and Social Sciences materials.

The validation results from media experts in this study show that the developed wordwall web-based interactive learning media meet very high eligibility criteria, specifically in display and programming aspects. Both received a feasibility percentage of 100%, indicating the media meets quality standards for visual design and system functionality.

For display, several visual quality indicators were assessed. Color suitability and aesthetics received a very good rating, supporting visual comfort and student focus by choosing harmonious, readable colors. Neatness and layout consistency also received a very good assessment. Such layouts aid navigation and comprehension, reducing user confusion and increasing efficiency.

The clarity of icons, buttons, and text was rated very good, as these elements help students use media independently without technical difficulties. Design suitability for the age and characteristics of elementary students was also rated very well. Tailoring design to grade IV cognitive and psychological development improves effectiveness, using bright colors and simple visuals for easier comprehension.

Availability of supporting images or animations also received a very good rating. Such visuals clarify concepts and aid students' memory of the material.

Overall, the display assessment indicates the developed media are highly suitable for grade IV Natural and Social Sciences, meeting feasibility indicators and design principles for engaging, effective learning. (Da'Ima et al., 2025, Babayeva, 2025).

The validation results show that the developed learning media follow instructional design principles: clarity, simplicity, and visual appeal. These principles help students process information systematically and efficiently.

According to multimedia learning theory, appropriate visual elements increase students' attention and motivation. Attractive media displays spark interest in learning and create a more interactive environment. Good visual design enhances the delivery of information in the learning process.

Media expert validation assesses not just display but also programming aspects related to technical quality. Experts reviewed button functions, page navigation, system stability, access speed, and interactivity. All programming indicators received excellent assessments from media experts.

The first indicator, the functionality of buttons or features, received a very good rating. This shows that every feature in the media functions properly for its intended use. The

reliability of these functions is crucial for ensuring a smooth digital learning process. The second indicator, interpage navigation and interaction logic, also received excellent ratings. Systematic navigation makes it easier for students to move between material sections and understand the learning flow. The third indicator, media stability, received a very good assessment. A stable system demonstrates a well-managed development process and ensures user comfort. The fourth indicator, access speed and media response time, also received excellent ratings. Optimal speed enables students to use the media without technical barriers, increasing convenience and effectiveness. The last indicator, media interactivity, also received excellent ratings. Interactivity enables students to be actively involved in learning, which helps them better understand the material through the web-based wordwall media.

Based on these assessments, the developed learning media are highly valid from a programming perspective. The program's quality meets usability and interactivity standards. With a stable system, clear navigation, and good interactivity, wordwall-based media supports effective learning in elementary school Natural and Social Sciences classes. Material expert validation found wordwall highly valid, with a 96% validity percentage. The media meet the standards for content accuracy, curriculum fit, and learning objectives. This aligns with previous research on wordwall's effectiveness (Ayustyaningtias et al., 2025).

This learning media presents plant breeding as part of the Natural and Social Sciences for grade IV students. Material experts confirm the content matches students' cognitive development. The clear, systematic presentation helps students understand concepts better. Aligning the material with students' characteristics ensures effective use in the learning process.

Additionally, the material uses visual elements to support its feasibility. Visual media attracts students and clarifies information in the learning process (Saxena, 2021). Visual elements such as images, illustrations, and graphic displays can serve as the focal point, directing students' attention to the material being studied. Thus, the use of visual media in the wordwall platform can help increase the effectiveness of material delivery.

From the perspective of learning theory, the use of visual media also strengthens understanding of concepts through more concrete representations (Arbab & Rizwan, 2024). Elementary school students generally find it easier to understand information presented through images or visuals compared to text explanations alone. Therefore, integrating text and visuals in interactive learning media can help students process information more effectively and improve their memory for the material learned.

The validation results from material experts show that the wordwall web-based interactive learning media is suitable for Natural and Social Sciences learning. This media meets material feasibility standards. It also supports students' learning needs by aligning with their developmental characteristics. Thus, using this media can help improve learning quality and optimally support learning goal achievement.

4 Conclusions

The research demonstrates that wordwall, a web-based interactive learning media for Natural and Social Sciences, is highly feasible for use with grade IV students at Madrasah Ibtidaiyah Negeri Semarang City. Validation by media experts yielded a score of 50 (average 5.0, validity rate 100%), while subject matter experts gave a score of 48 (average 4.8, validity rate 96%). These findings indicate that wordwall is highly valid and suitable for classroom implementation.

These high validity scores confirm that the developed media meet standards in both design and learning content. Wordwall offers interactive features, visual displays, easy

navigation, and activities promoting student participation, making it likely to help students better understand the material while increasing their interest and engagement.

Overall, these results highlight that developing technology-based learning media, such as wordwall, is important for supporting elementary school learning. In practice, this approach enables teachers to create engaging, interactive content suited to the advancement of educational technology, ultimately enhancing the quality of learning and supporting the achievement of learning goals.

References

Adiansha, A. A., Syarifuddin, Syarifudin, Diana, N., & Asriyadin. (2025). The Impact of Integrating the Wordwall Website in Student-Centered Learning on Numeracy Problem-Solving Skills in Elementary Schools. *International Journal of Information and Education Technology*, *15*(9). https://doi.org/10.18178/ijiet.2025.15.9.2381

Akrim, A., Zainal, Z., & Munawir, A. (2021). Development of interactive learning media in improving learning motivation. *International Journal of Evaluation and Research in Education*, 10(4), 1280–1288. https://doi.org/10.11591/ijere.v10i4.21662

Aliyah, H., Kusmayadi, T. A., & Fitriana, L. (2020). Interactive learning media based on MySQL technology in mathematics. *Journal of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/1613/1/012014

Alkadri, R., & Fauzi, A. (2020). Analysis of learning media in the development of flood-themed teaching materials for high school students. *Journal of Physics: Conference Series*, *1481*(1), 012059. https://doi.org/10.1088/1742-6596/1481/1/012059

Arbab, S. K., & Rizwan, F. (2024). *Generative AI and Web Applications: Addressing Security Issues and Challenges* (pp. 437–456). IGI Global. https://doi.org/10.4018/979-8-3693-3703-5.ch019

Arzeman, A., Haines, J., Pritchard, C., Rutherford, S., & Francis, N. (2026). Navigating new norms: a systematic review of factors for the development of effective digital tools in higher education. *FEBS Open Bio*, *16*(3). https://doi.org/10.1002/2211-5463.70151

Ayustyaningtias, R., Alinurdin, E., & Wahyudin, A. (2025). Improving Students' Critical Thinking Through Blended Learning Media Learning Game Word Wall. *ASEAN Journal of Educational Research and Technology*.

Babayeva, S. (2025). Didactic Principles and Strategies When Using Internet Resources. *Scientific Work*, *19*(5), 120–125. https://doi.org/10.36719/2663-4619/115/120-125

Budiarti, W., & Triyono, M.B. (2017). Need assessment developing multimedia interactive learning of geometry as instructional media. *Journal of Physics: Conference Series*. https://doi.org/10.1088/1742-6596/1567/4/042065

Chandra, M. R., Jureynolds, & Kun, Q. (2024). Utilizing Wordwall Mobile Apps to Improve Mandarin Language Skills. *2024 3rd International Conference on Creative Communication and Innovative Technology*. https://doi.org/10.1109/ICCIT62134.2024.10701231

Da'Ima, I. N. D., Agustin, D. R., & Halim, F. A. (2025). Development of android-based fraction game "gEMPA" (Game edukasi matematika Pecahan) for grade 5. *AIP Conference Proceedings*. https://doi.org/10.1063/5.0290029

Eisenmann, M. (2018). Differentiation and individualisation through digital media. In *Collaborative Learning and New Media: New Insights into an Evolving Field* (pp. 73–86). Peter Lang AG.

Fadilla, N., & Junaidi, M. (2025). Development of Zatase: a Zathura-Based Learning Media Using Assemblr Edu For Teaching Science in Islamic Elementary, Al-Aulad: Journal

of Islamic Primary Education, (1), 17–32.
Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275–285. https://doi.org/10.1016/j.susoc.2022.05.004
Haripriya, R., H., Rajamoorthy, R., K., S., L.M., N., & S, B. (2026). Systematic Survey of Traditional Teaching Methods Versus Design Thinking Based on Integrative Learning Through Student Perspectives. *Lecture Notes in Networks and System*, 531–540. https://doi.org/10.1007/978-981-96-7289-9_42
Khamparia, A., & Pandey, B. (2017). Impact of interactive multimedia in e-learning technologies: Role of multimedia in e-learning. In *Digital Multimedia: Concepts, Methodologies, Tools, and Applications*. Lovely Professional University.
Midak, L. Y., Buzhdyhan, K. V, Kuzyshyn, O. V., Pahomov, J. D., & Kravets, I. V. (2015). Interactive platform Wordwall within the New Ukrainian School's chemistry lessons. In P. University (Ed.), *CEUR Workshop Proceedings* (pp. 174–187). Vasyl Stefanyk Carpathian National University.
Muskhir, M., Luthfi, A., Julian, R., & Fortuna, A. (2023). Exploring iSpring Suite for Android-Based Interactive Instructional Media in Electrical Lighting Installation Subject. *International Journal of Interactive Mobile Technologies*, *17*(2). https://doi.org/10.3991/IJIM.V17I22.42625
Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational Psychology Review*, 32(1), 77–112. https://doi.org/10.1007/s10648-019-09498-w
Saxena, P. (2021). Effectiveness of social media promotion for online shopping sites: A study on buying behavior of consumer. *Journal of Content, Community and Communication*, *13*(7), 351–359.
Sembiring, A., Lubis, M., Perdana, I., Ramadhan, Y. Z., & Permata, N. A. (2024). Design and Development of History Learning Media Prototype to Enhance Student Engagement and Comprehension: Integration of SDLC and Bloom's Taxonomy. *2024 12th International Conference on Cyber and IT Service Management*. https://doi.org/10.1109/CITSM64103.2024.10775768
Sujarwo, Herawati, S. N., Sekaringtyas, T., Safitri, D., & Lestari, I. (2022). Android-Based Interactive Media to Raise Student Learning Outcomes in Social Science. *International Journal of Interactive Mobile Technologies*, *16*(7). https://doi.org/10.3991/ijim.v16i07.25739
Tiagarajah, R., A, & Said, M. N. H. B. M. (2022). The Effect of Game-Based Application in Improving Students' Engagement towards Learning Malay Language in Primary School. *Proceedings - International Conference on Education and Technology, ICET*. https://doi.org/10.1109/ICET56879.2022.9990607
Umami, N. R., Djubaedi, D., Nashruddin, W., Program, P., Islam, U., Siber, N., & Nurjati, S. (2025). *The effectiveness of technology-based islamic religious education learning media in improving motivation and learning outcomes of elementary school students*. *8*(2), 86–97.
Zeng, J., Sun, D., Looi, C.-K., & Fan, A. C. W. (2024). Exploring the impact of gamification on students' academic performance: A comprehensive meta-analysis of studies from the year 2008 to 2023. *British Journal of Educational Technology*, *55*(6). https://doi.org/10.1111/bjet.13471