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# Needs Analysis of AI-Based Quizizz Teaching Materials for Natural and Social Sciences Learning in Elementary Schools in the Era of Industrial Revolution 5.0

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**Abstract**
This study aims to analyze the needs for developing AI-based Quizizz teaching materials for Natural and Social Sciences learning in elementary schools amid the Industrial Revolution 5.0. Employing a qualitative descriptive approach, data were collected through observations, questionnaires, and interviews with 12 grade VI teachers and 150 students at SDN Sidotopo I Surabaya. Findings revealed that current teaching materials remain largely conventional, heavily reliant on textbooks and printed workbooks, with limited use of digital or interactive resources. However, some classrooms exhibited innovation through the use of multimedia presentations and group discussions, enhancing student engagement. Both teachers and students expressed a strong need for interactive, accessible, and adaptive learning materials that incorporate artificial intelligence to support personalized learning and formative assessment. This need aligns with the demands of Industry 5.0, which emphasizes human-technology collaboration and digital literacy. The study concludes that integrating AI-driven platforms like Quizizz can foster more effective, engaging, and personalized learning experiences in Natural and Social Sciences. Recommendations include increased teacher training, infrastructure improvements, and collaborative development of digital learning materials tailored to elementary education contexts.

## INTRODUCTION

21st century education demands a learning transformation that focuses not only on knowledge transfer, but also on the development of critical thinking skills, creativity, and digital literacy (Hidayat, 2021). The rapid development of digital technology, especially artificial intelligence (AI), has changed the traditional learning paradigm to be more interactive and adaptive (Wijiati et al., 2024). In the era of the Industrial Revolution 5.0, human collaboration and intelligent technology are the main keys in creating a relevant and effective learning process. Elementary schools as the foundation of formal education are required to adopt digital technology to prepare students to face future challenges. However, in practice, many elementary schools still use conventional teaching materials without the integration of modern technology. This leads to a mismatch between the needs of students who are used to the digital world and less attractive learning methods. Therefore, the development of teaching materials that integrate AI and interactive platforms is an urgent need (Velander et al., 2024). In this

context, this study aims to examine the need for Quizizz AI-based teaching materials in elementary schools in response to the demands of the Industrial Revolution 5.0.

Natural and Social Science (IPAS) learning in elementary schools has an important role in building students' foundations of knowledge, scientific skills, and critical attitudes (Agustina et al., 2022). The integration of technology in IPAS learning can enrich students' learning experience through the presentation of more contextual and interactive materials. The use of digital learning platforms such as Quizizz which is based on AI is able to provide a personalized learning experience and real-time learning evaluation (Fauziah & Sofian Hadi, 2023). With gamification and automatic feedback features, Quizizz AI can increase student motivation and engagement in social studies learning. However, the main challenge faced is the readiness of schools, teachers, and teaching materials that support the use of this technology (Salsabila et al., 2020). Needs analysis is an important first step to understanding the gap between actual and ideal conditions in the implementation of technology-based teaching materials (Solihin, Puspita, et al., 2024). Infrastructure readiness, teachers' digital competence, and the characteristics of teaching materials must be the focus in learning development. Despite the increasing trend of digital technology integration in education, there is a lack of specific research investigating how AI-based platforms like Quizizz can be systematically adapted to the context of IPAS learning in elementary schools. This leaves a critical gap in understanding the specific needs and readiness factors within elementary education settings.

The Industrial Revolution 5.0 emphasizes harmonious collaboration between humans and intelligent machines, which allows the learning process to be more adaptive and personalized. Digital transformation in education brings both challenges and great opportunities in creating an inclusive and dynamic learning environment (Rambung et al., 2023). In the context of elementary school, digital technology must be designed to fit the cognitive and psychosocial development stages of students. Platforms like Quizizz AI can provide learning that is not only content-based, but also attentive to students' learning styles and individual needs (Fauziah & Sofian Hadi, 2023). The availability of teaching materials that are adaptive and responsive to technology is a key factor in the success of this integration (Anggoro & Pratiwi, 2023). Nevertheless, there is still minimal empirical evidence explaining the practical needs and challenges faced by teachers and students in integrating AI-based interactive platforms in Natural and Social Sciences subjects, especially at the elementary school level (Nafi'ah et al., 2024). Therefore, this research is important to fill these gaps and provide recommendations for the development of innovative and relevant teaching materials. Proper technology integration is believed to significantly improve the quality of learning and student learning outcomes (Solihin et al., 2024).

The importance of contextual and digital technology-based teaching materials has been widely supported by previous research showing increased student engagement and learning achievement (Nasution & Yusnaldi, 2024). The use of AI in education is able to provide faster and more accurate feedback, as well as encourage students' independent learning (Saraswati et al., 2024). Quizizz as a game-based interactive learning platform has great potential to change the classroom atmosphere to be more fun and positively competitive (Anggraeni, 2024). However, the application of this technology needs to be adjusted to the characteristics of students and school conditions so as not to create a digital divide. Therefore, teachers need support in the form of ready-to-use and easily accessible teaching materials, as well as adequate training in using the technology. The limitations of teaching materials that integrate AI are currently a major obstacle in the implementation of digital learning in elementary schools. This research will identify these needs in depth to support an effective and enjoyable learning process. The results of the research are expected to be a reference for curriculum developers and education practitioners in designing future teaching materials.

Teachers as learning facilitators play an important role in the successful integration of digital technology in elementary schools (Mulyono et al., 2023). Teachers' digital competence and attitudes towards technology greatly influence the use of AI-based teaching materials in the learning process (Wibowo et al., 2025). Research shows that ongoing training and support are key to improving

teachers' ability to implement learning technologies. In addition, student involvement in interactive and personalized learning can increase motivation and learning outcomes. Therefore, the development of Quizizz AI-based teaching materials must consider technical and pedagogical aspects to support the needs of teachers and students (Yusof et al., 2024). A comprehensive needs analysis will help identify the obstacles and potentials that exist in elementary schools as the basis for the development of effective teaching materials. With this approach, it is hoped that IPAS learning can be more adaptive to the demands of the times and improve the quality of basic education. This study addresses the gap by providing empirical data on teachers' and students' readiness, challenges, and expectations towards AI-integrated teaching materials in elementary schools, contributing valuable insights to the educational technology field.

## METHODS

This study uses a qualitative descriptive approach to analyze the needs of Natural and Social Sciences (IPAS) learning materials based on Quizizz AI in elementary schools. This approach was chosen because it is able to describe in depth the actual conditions and needs that exist in the context of using learning technology. The research subjects consisted of grade VI teachers and teaching materials used in IPAS learning in several elementary schools in the Surabaya area. The sampling technique is carried out purposively, taking into account teachers who have experience using digital technology in learning.

Data collection was carried out through three main techniques, namely semi-structured interviews, participatory observation, and documentation. The interview was conducted to explore teachers' opinions regarding the current state of teaching materials and the need for the development of Quizizz AI-based teaching materials. Observations are focused on the social studies learning process that takes place to see how conventional teaching materials are used and how students interact with digital learning media. Documentation in the form of printed and digital teaching materials which is currently used as a comparison material in needs analysis. Before data collection, instrument validation was conducted through expert judgment involving two experts in educational technology and curriculum development. The interview guidelines and observation sheets were piloted in one elementary school outside the main sample to ensure clarity and relevance. Feedback from the pilot testing was used to refine the instruments. Data analysis was carried out using thematic analysis techniques, which included the stages of data collection, editing, coding, theme grouping, and interpretation (Braun & Clarke, 2019). The thematic analysis followed six phases: (1) familiarization with data by reading transcripts repeatedly, (2) generating initial codes based on recurring patterns, (3) searching for themes by collating codes into potential themes, (4) reviewing themes to ensure consistency with the coded data and the full dataset, (5) defining and naming themes to capture the essence of each category, and (6) producing the final report with illustrative quotes from participants. At the editing stage, the data obtained from interviews and observations are selected so that only relevant data is further analyzed. Furthermore, the data was coded based on categories that were in accordance with the focus of the research, namely the characteristics of teaching materials, the needs of teachers and students, and the relevance of technology in science learning. Theme grouping is done to identify key emerging patterns and needs.

To maintain the validity of the data, this study uses triangulation of data sources and data collection techniques. Triangulation is carried out by comparing the results of interviews, observations, and documentation to obtain a comprehensive picture. In addition, the researcher also conducted member checking with the informants to ensure that the interpretation of the data was in accordance with the actual conditions. Validity is also enhanced through discussions with peers to gain an objective perspective. The research instrument consists of interview guidelines, observation sheets, and the format of documentation of teaching materials. The interview guidelines were developed based on research objectives and literature review related to the development of teaching materials based on digital technology. The observation sheet is designed to record aspects of the use of

teaching materials and learning interactions during the teaching and learning process. Meanwhile, documentation is collected to analyze the content and format of existing teaching materials. This research was conducted over three months, divided into specific phases: (1) the preparation phase in the first month, which included literature review, instrument development, and pilot testing; (2) the data collection phase in the second month, involving interviews, observations, and documentation; and (3) the data analysis and reporting phase in the third month, including coding, thematic analysis, and validation through member checking. The results of the research are expected to provide a clear picture of the needs of Quizizz AI-based IPAS teaching materials as well as recommendations for its development that are relevant to the demands of the Industrial Revolution 5.0. Thus, the findings of this study can be the basis for the development of more adaptive and innovative teaching materials in elementary schools.

## RESULTS AND DISCUSSION

### Results

This study was conducted in three sixth-grade classes at SDN Sidotopo I Surabaya: classes VI A, VI B, and VI C. The focus was to investigate how learning materials are used, how the learning process is carried out, and how evaluations are conducted in the Integrated Science and Social Studies (IPAS) subject. The findings from observations are as follows Table 1.

**Table 1.** Use of Learning Materials, Learning Process, and Evaluation

| Class | Learning Materials | Learning Process | Evaluation |
|---|---|---|---|
| VI A | Textbooks provided by the school, with content following the textbook | Classroom teaching dominated by lectures; teacher-centered, with students mostly passive | Evaluation conducted through written tests using the same questions for all students |
| VI B | Textbooks provided by the school, same as VI A | Lecture method followed by group discussions and presentation of discussion results; however, many students were confused due to limited references in the textbook | Evaluation through written tests with identical questions for all students, no process-based assessment |
| VI C | Textbooks and teacher-created PowerPoint (PPT) presentations supporting the material | More active learning through group discussions and presentations; some students actively engaged; strategic grouping to foster collaboration and participation | Combined evaluation of written tests and assessment of student activity during discussions and presentations |

Although all three classes primarily used textbooks, there were significant differences in their learning processes and evaluation methods. Class VI A relied heavily on lecture-based teaching that is one-directional and lacks active student involvement. Class VI B attempted a more interactive approach with group discussions and presentations but faced challenges due to the limited references in the textbook, which led to student confusion and less active participation. In contrast, class VI C combined printed textbooks with digital media (PPT presentations) to enrich the material delivery. This class adopted a student-centered learning model with active group discussions and presentations, increasing student engagement. The evaluation method in VI C was also more comprehensive, assessing not only written test results but also the learning process, such as participation and presentation performance, thus providing a fuller picture of student competencies.

**Table 2.** Intensity of Learning Material Usage Based on Questionnaire

| Learning Material Type | Usage Intensity in VI A | Usage Intensity in VI B | Usage Intensity in VI C |
|---|---|---|---|
| Textbooks | Very Often | Very Often | Very Often |
| Handouts | Rare | Rare | Rare |
| Worksheets (LKS) | Very Often | Often | Often |
| E-books | Rare | Rare | Often |
| Audio Materials | Rare | Often | Often |
| Visual Materials | Often | Often | Often |
| Audio-Visual Materials | Often | Often | Occasionally |

The questionnaire results show that textbooks and worksheets remain the most frequently used learning materials in all classes. Other materials such as handouts and e-books are used sparingly, especially in VI A and VI B. However, VI C shows a different trend, with higher frequency of e-book and audio-visual material usage, indicating greater adaptability and openness to integrating digital media into learning. Although audio-visual materials are used in all classes, the usage in VI C is more targeted, supporting a more interactive and varied learning environment.

*Results from Interviews with Teachers and Students*

1) Current Characteristics of Learning Materials: Teachers rely heavily on printed textbooks provided by the government and conventional worksheets (LKS). Digital learning materials are still rarely used due to limited access and lack of training in their use.
2) Needs of Teachers and Students: Teachers express the need for interactive, easily accessible learning materials that support quick formative assessments. Students respond positively to quiz- or game-based learning methods, such as those offered by the Quizizz platform, showing increased motivation and enthusiasm when learning through interactive media that incorporate gamification elements.
3) Relevance to the Industrial Revolution 5.0: The development of Quizizz AI-based learning materials aligns well with the demands of the Industrial Revolution 5.0, which emphasizes personalized, data-driven, and interactive learning. AI integration allows teachers to monitor learning progress in real time and make timely interventions, while also fostering students' critical and creative thinking skills.

The study concludes that combining printed learning materials with digital media, as demonstrated in class VI C, results in better student engagement and learning outcomes. Interactive teaching methods and evaluations that include process assessment, in addition to written tests, significantly improve the quality of IPAS learning. Furthermore, digital and AI-based learning tools like Quizizz are highly recommended to address the challenges of education in the Industrial Revolution 5.0 era. Therefore, developing innovative and technology-integrated learning materials is essential to enhance the effectiveness and relevance of primary education.

**Discussion**

The results of this study indicate significant differences in teaching strategies and material usage among the three classes observed. Class VI A relied predominantly on traditional lecture methods, which align with teacher-centered approaches frequently criticized for limiting student engagement (Fauziah & Sofian Hadi, 2023). In contrast, class VI B integrated group discussions and presentations, albeit hindered by limited textbook references, highlighting the importance of comprehensive learning resources in active learning environments. Class VI C employed a blended approach combining textbooks and digital media such as PowerPoint, resulting in more active student participation and collaborative learning. This finding supports previous research suggesting that multimedia-enhanced instruction fosters deeper cognitive engagement and motivation among students (Sintya et al., 2020). Moreover, the inclusion of process-based evaluations in class VI C allowed teachers to assess both student knowledge and active involvement, addressing a gap found in traditional assessment methods (Putri et al., 2024). Thus, this study corroborates the growing consensus that diversified teaching methods and comprehensive assessments enhance learning quality. It also underscores the challenges teachers face when relying solely on textbook-based instruction, especially in the digital era.

The questionnaire data further reveal that while textbooks and worksheets remain dominant learning materials, there is an emerging trend toward the use of digital resources, especially in class VI C. This trend reflects global educational shifts toward integrating technology to support differentiated learning (Tanto et al., 2024). Digital media such as e-books and audio-visual materials provide multimodal inputs that cater to various learning styles, thereby increasing accessibility and student engagement. However, the limited use of digital tools in classes VI A and VI B suggests

barriers such as insufficient technological infrastructure or lack of teacher training. Encouragingly, class VI C's use of digital media aligns with UNESCO's recommendation to enhance digital literacy and resource diversity in classrooms (Liriwati, 2023). This gradual integration of technology highlights the necessity for ongoing professional development for educators to fully leverage digital tools. Furthermore, students' positive responses to multimedia learning reinforce the value of interactive content in sustaining motivation and improving comprehension. Thus, fostering technological adoption in schools is vital for preparing students to meet contemporary learning demands.

Interviews with teachers and students provide critical insights into the contextual needs for learning materials in the era of Industry 5.0. Teachers expressed a desire for interactive and accessible materials that support formative assessments, reflecting the shift toward data-driven and student-centered learning (Agustianti et al., 2022). Students favored quiz-based and gamified learning platforms such as Quizizz, which align with motivational theories emphasizing engagement through play and immediate feedback (Kurniardi, 2024). These findings resonate with studies showing that gamification can significantly enhance students' intrinsic motivation and learning outcomes. Importantly, the integration of AI in learning platforms, as suggested in this study, matches the educational paradigm of Industry 5.0, where personalized learning pathways and adaptive feedback are critical (Normuminov, 2024). This technological advancement helps address individual learning gaps while promoting collaborative and critical thinking skills. The expressed needs also highlight the challenge of bridging the gap between technological potential and actual classroom practice. Collaborative efforts between educators and technologists are therefore essential to design effective and practical learning tools. Overall, the interviews confirm that the future of education lies in the seamless integration of innovative digital resources with sound pedagogical strategies.

The findings regarding evaluation methods point to a need for more holistic assessment approaches in elementary education. While all classes used written tests, only class VI C incorporated assessments of student participation and group work. This approach aligns with formative assessment principles, which emphasize ongoing feedback and process evaluation to support student learning (Nurhayati et al., 2025). Research has shown that such comprehensive assessments improve student motivation and provide teachers with richer information to guide instruction. The absence of process-based evaluation in classes VI A and VI B suggests a missed opportunity to fully capture students' competencies beyond factual knowledge. Moreover, the reliance on uniform tests may disadvantage students with different learning styles or needs. Implementing varied and formative assessments can promote a more inclusive and equitable learning environment. Hence, educational policy and teacher training should encourage assessment diversification to foster holistic student development (Mujiburrahman et al., 2023). This study confirms the positive impact of blending traditional and innovative assessment techniques in primary education.

The role of multimedia in supporting active learning emerged strongly in class VI C, where PowerPoint presentations and group discussions encouraged student interaction. Multimedia learning theory suggests that combining visual and verbal materials helps reduce cognitive load and facilitates better understanding (Widodo & Yermiandhoko, 2021). The use of group discussions and presentations also aligns with social constructivist theories, which emphasize learning through collaboration and dialogue (Vygotsky, 1978). Such active learning environments are linked to improved critical thinking, communication skills, and knowledge retention. However, the limited adoption of multimedia in classes VI A and VI B reveals disparities in resource availability and teacher readiness to apply these methods. Addressing these gaps requires targeted investment in digital infrastructure and ongoing professional development. The positive outcomes observed in VI C reinforce the call for integrating multimedia resources into standard teaching practice. This approach not only engages students more fully but also prepares them for the technological demands of the modern world. Therefore, schools should prioritize multimedia integration to enhance the overall quality of education.

The findings also highlight the importance of contextualizing learning materials within the framework of the Industrial Revolution 5.0, which emphasizes human-centric and AI-supported education. AI-driven platforms like Quizizz provide adaptive learning opportunities tailored to individual student needs, supporting personalized instruction (Azizah et al., 2025). Such platforms enhance real-time monitoring and feedback, enabling timely interventions by teachers. Furthermore, these tools foster student autonomy and critical thinking, key competencies for success in the evolving educational landscape. Integrating AI with pedagogy requires that teachers develop skills not only in technology use but also in interpreting learning analytics data (Yusof et al., 2024). The study's participants expressed readiness to adopt these innovations if adequate support is available. This signals a broader educational shift toward embracing technology-enhanced learning to improve outcomes and relevance. Hence, policymakers should support initiatives that blend AI technology with pedagogical best practices.

The study's limitations, such as reliance on self-reported data and observations in a limited number of classes, suggest caution in generalizing the findings. Future research should involve larger samples and include experimental designs to measure the impact of AI-based materials on student learning outcomes more rigorously (Yusof et al., 2024). Additionally, longitudinal studies could examine how sustained use of digital tools influences student motivation and achievement over time (Lestyono et al., 2024). Despite these limitations, the study provides valuable insights into the current state of teaching materials and pedagogical strategies in Indonesian elementary schools. It also highlights opportunities to improve learning by incorporating digital innovation and process-oriented assessments. The findings contribute to the growing literature on effective primary education practices in the digital era (Solihin et al., 2025). Researchers and practitioners alike can benefit from understanding how to navigate challenges and leverage opportunities in educational technology integration.

In conclusion, this study demonstrates the critical role of innovation in learning materials, teaching methods, and evaluation to enhance student engagement and achievement. Class VI C's approach exemplifies the benefits of blending traditional and digital resources while adopting interactive and formative pedagogies. The study aligns with international educational trends advocating for personalized, technology-enhanced, and process-oriented learning environments (Anggraeni, 2024). To realize these benefits more broadly, investment in teacher training, digital infrastructure, and collaborative development of learning tools is essential. Embracing AI and multimedia resources supports not only academic success but also prepares students for the complexities of Industry 5.0 and beyond. Ultimately, educational stakeholders must prioritize innovation and flexibility to meet evolving learner needs effectively. Continued research and policy support are necessary to sustain these advances and ensure equitable access for all students. This study serves as a foundation for further exploration and implementation of transformative educational practices.

## CONCLUSION

This study reveals distinct differences in teaching materials, instructional methods, and evaluation practices across three sixth-grade classes at SDN Sidotopo I Surabaya. While all classes primarily used textbooks, class VI C demonstrated innovative practices by integrating multimedia presentations and interactive group discussions, which resulted in higher student engagement and participation. The evaluation methods in class VI C were also more comprehensive, combining written tests with assessments of student activity during discussions and presentations. The use of digital learning resources such as e-books and audio-visual media was more prominent in class VI C, indicating a gradual shift toward technology-enhanced learning environments. Interviews with teachers and students highlighted the need for interactive, accessible, and AI-supported learning materials to meet the demands of the Industry 5.0 era. The findings suggest that a blended approach to teaching combining traditional and digital resources, active learning strategies, and formative

assessments can improve both student motivation and learning outcomes. However, barriers such as limited reference materials, lack of teacher training, and uneven technology access remain challenges to broader implementation. Overall, the study underscores the importance of innovating educational practices to foster more effective, inclusive, and engaging learning experiences.

Future research is recommended to expand the scope of investigation by involving a larger number of schools and diverse geographical settings to enhance the generalizability of findings. Additionally, experimental studies can be conducted to measure the direct impact of AI-based teaching materials on student learning outcomes in Natural and Social Sciences. Longitudinal research is also suggested to examine how sustained use of AI platforms like Quizizz influences student engagement, motivation, and academic achievement over time. Exploring teacher professional development models that effectively integrate AI technology into classroom practices is another critical avenue for future inquiry.

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