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Transforming Indonesian Language Learning Through Augmented Reality-Based Kiddorami Flashcards in Elementary Schools

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ABSTRACT

The development of digital technology has changed the world of education, especially in learning Indonesian in Elementary Schools. This study discusses the transformation of Indonesian language learning through Augmented Reality (AR)-based Kiddorami Flashcards to improve letter recognition and vocabulary of grade 1 students at SD Negeri Ngadirejo 04. This study uses a descriptive qualitative method, with data collection through observation, interviews, and documentation. Planning begins with an analysis of student needs and preparation of technology infrastructure. Implementation is carried out through small group learning with interactive 3D visualization, which improves vocabulary understanding, letter recognition, and student participation. Supporting factors include the availability of technology and student enthusiasm, while the main obstacles are limited time and media access. The solution implemented is the use of a projector for collective AR access. The results of the study show that AR-based Kiddorami Flashcards significantly improve students' letter recognition and vocabulary, creating a more interactive, engaging, and technology-based learning experience. Increased student engagement and better understanding of the material prove that the use of AR in Indonesian language learning can bring positive transformations in teaching methods in Elementary Schools.

Keywords: Augmented Reality, Elementary School, Kiddorami Flashcards, Letter Recognition And Vocabulary

INTRODUCTION

The advancement of digital technology has brought significant changes in the world of education, including in learning Indonesian in elementary schools [1] . Mastery of Indonesian, especially the introduction of letters and vocabulary, is an important foundation for elementary school students in grade 1 to develop their literacy skills. Good vocabulary mastery is positively correlated with reading comprehension skills, students with a wider vocabulary tend to have a higher level of reading comprehension [2].

However, the challenges of learning Indonesian are still a concern in various elementary schools. For example, research [3] found that nearly 47.6% of first grade students had early reading difficulties, such as recognizing letters and reading syllables, reading difficulties, such as recognizing letters and reading syllables. Other studies [4] identified that around 80% of students have difficulty recognizing letters of the alphabet, while 60% face challenges in reading words. At SD Negeri Ngadirejo 04, the results of initial observations on September 5, 2024 showed that out of 11 grade 1 students, only 2 students were fluent in reading, while 9 students faced obstacles such as difficulty recognizing certain letters, limited vocabulary mastery, and one student who needed special attention. This emphasizes the need for an innovative approach in learning Indonesian.

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One solution that can be used to overcome this is by utilizing Augmented Reality (AR) technology. AR is a technology that combines digital elements with the real world in real-time to produce an interactive and immersive learning experience. This technology allows users to see virtual objects integrated with the real environment through devices such as smartphones or tablets [5]. In the context of education, AR has been shown to increase student engagement, facilitate understanding of abstract concepts, and provide a more engaging learning experience [6]. Research by [7] also showed that the use of AR in vocabulary recognition helps students understand and remember the material better through visualization and direct interaction.

Further research supports the effectiveness of AR in Education, [8] found that the implementation of AR technology successfully increased student motivation from 45% to 85%, showing a significant impact on student engagement. In addition, [9] added that the implementation of AR learning media not only increases student engagement, but also has the potential to be a concrete solution to overcome digital literacy challenges in the contemporary era by creating a more interactive and engaging learning experience.

Kiddorami is an AR-based flashcard product that has been circulating and is available on the market as an innovative, ready-to-use product. Kiddorami provides a practical solution for educational institutions and parents who want to integrate modern technology into the language learning process. Kiddorami combines traditional concepts with AR technology, where students can see 3D animations relevant to certain images when the flashcard is scanned using a smart device. This uniqueness not only enriches students' learning experience through attractive visualizations, but also facilitates multisensory learning, which combines visual, kinesthetic, and interactive elements. Research by [10] shows that AR-based flashcard media can help students master the material thoroughly.

The integration of AR technology into Kiddorami Flashcards provides a variety of benefits. It enables immersive 3D object visualization, provides contextual learning experiences, and increases student motivation through interactive features such as mini-games. This AR-based approach also enables personalization of learning according to individual student needs, supports basic literacy acquisition, and develops digital skills. With social media platforms such as Instagram used to access AR features, Kiddorami flashcards offer wide accessibility, making it a practical and modern learning tool. [11] highlights that the use of AR media can create more interesting and effective learning.

This study focuses on the exploration of the transformation of Augmented Reality-based Kiddorami flashcards in Indonesian language learning for letter and vocabulary recognition. The main objectives of this study are to describe the planning, implementation, supporting and inhibiting factors, and solutions in the application of Augmented Reality-based Kiddorami flashcards. By using a descriptive qualitative approach, this study is expected to provide comprehensive insights into the potential of AR technology in improving the quality of Indonesian language learning. More than just measuring learning outcomes, this study intends to understand the dynamics of the learning process and students' subjective experiences in interacting with this innovative media. The theoretical and practical contributions of this study are expected to bridge the gap between traditional pedagogical practices and the demands of literacy development in the digital era[12].

AR-based Kiddorami not only functions as a learning medium, but also as a representation of a student-centered pedagogical approach. By combining visual, interactive, and kinesthetic elements, this study is expected to provide theoretical and

practical contributions in understanding the role of AR technology in Indonesian language learning, as well as filling the research gap related to the application of this technology at the elementary education level.

MATERIAL AND METHODS

This study uses a descriptive qualitative approach with a case study method, which aims to describe, analyze, and interpret educational phenomena in depth [13]. The case study method was chosen to comprehensively understand the transformation of Augmented Reality (AR) based Kiddorami Flashcard in Indonesian language learning towards letter recognition and vocabulary of grade 1 students. The qualitative approach was used because it provides flexibility in exploring in-depth data about the learning process. Unlike the quantitative approach which focuses more on numerical measurements, the qualitative approach allows exploration of subjective experiences, social interactions, and dynamics of AR technology implementation in the context of elementary education. This approach was also chosen because it is suitable for exploring relatively new and complex phenomena, such as the use of AR technology in Indonesian language learning in elementary schools. Through a qualitative approach, this study can reveal contextual and unique aspects that cannot be fully represented through quantitative data. The study was conducted at SD Negeri Ngadirejo 04, located at Jl. Slamet Riyadi Jl. Gempol, Ngadirejo, Kartasura District, Sukoharjo Regency, Central Java. The selection of the location was based on the availability of AR-based Kiddorami flashcard media and the school's willingness to be the object of research.

Data collection techniques used three main methods, namely participant observation, in-depth interviews, and documentation. Participatory observation was carried out by researchers being directly involved in learning activities, observing aspects of the suitability of learning implementation, teacher-student interactions, and student responses. Semi-structured interviews were conducted with teachers and grade 1 students to gather information about planning, implementation, and learning experiences. Documentation was carried out by collecting visual and written evidence related to learning. To ensure the validity of the data, this study used source triangulation and technique triangulation. Source triangulation was carried out by comparing data from teachers and students, while technique triangulation compared data from observations, interviews, and documentation [14].

Data analysis using the Miles and Huberman interactive model which consists of three components, namely data reduction, data presentation, and drawing conclusions [15]. Data reduction is done by identifying, selecting, and organizing relevant data and data presentation is done in the form of descriptive narratives and structured texts, while drawing conclusions is done through a systematic verification process by comparing data from various sources and connecting findings with relevant theories.

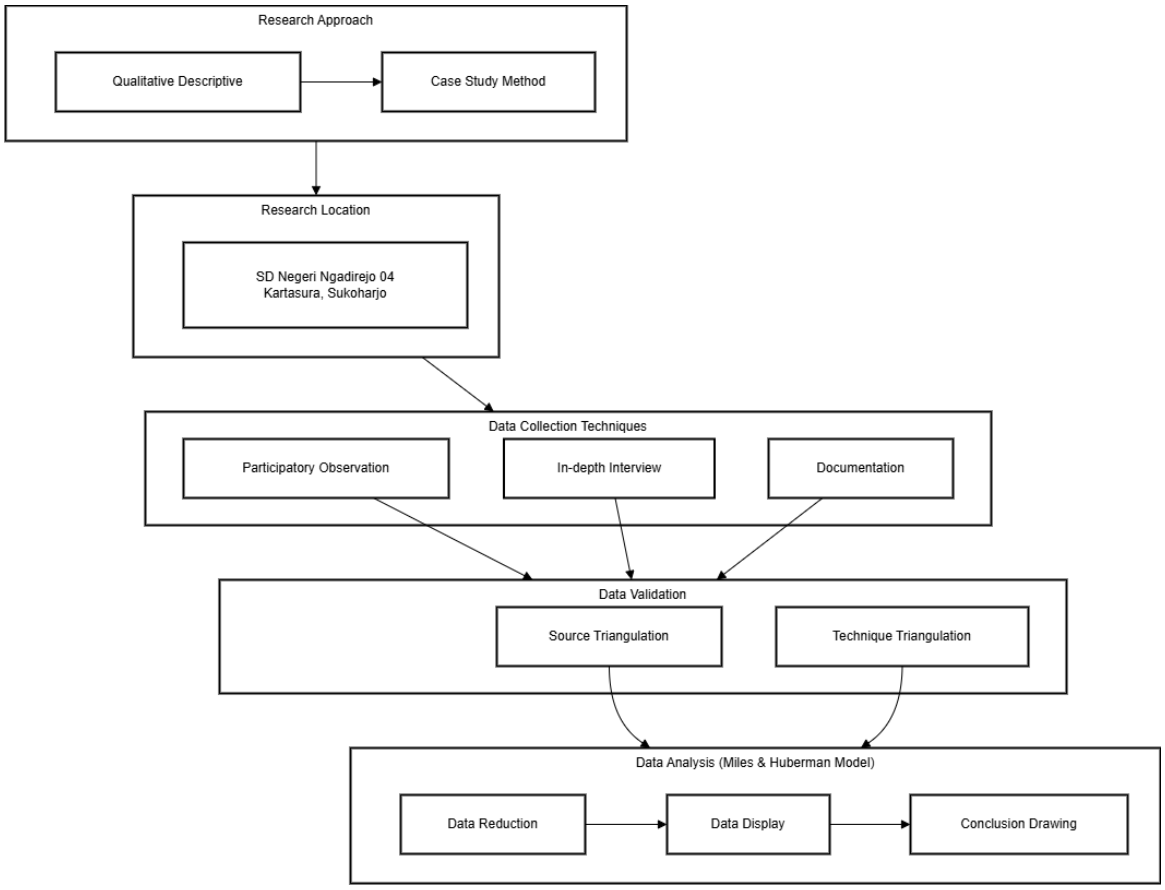

Figure 1. Flowchart of the Research Carried out

RESULTS AND DISCUSSION

Research on the application of Kiddorami flashcards based on Augmented Reality was conducted at SD Negeri Ngadirejo 04 with the aim of transforming the approach to learning Indonesian. Through a series of systematic stages, this study explores the potential of AR technology in improving letter recognition and vocabulary skills of grade 1 students.

Initial Conditions of Indonesian Language Learning at Ngadirejo 04 Public Elementary School

Based on the results of initial observations conducted on September 5, 2024 at SD Negeri Ngadirejo 04, several significant conditions were found related to Indonesian language learning in grade 1. Analysis of the learning situation before the implementation of Flashcard Kiddorami showed that the learning methodology was still dominated by a conventional approach, with the use of traditional learning media such as letter posters and letter wheels as the main instruments in the teaching and learning process. In-depth observations revealed that this approach tends to produce one-way learning interactions and is less able to maintain the level of active student involvement in the duration of continuous learning. Identification of the learning challenges faced revealed the complexity of the problems that require comprehensive solutions. Observation data showed that out of a total of 11 grade 1 students, there was significant variation in basic literacy skills. The following is the distribution of student abilities based on the results of

the initial assessment:

Table 2. Distribution of Student Abilities

Ability Category	Number of Students	Percentage
Fluent Reading	2	18.20%
Difficulty Recognizing Letters	5	45.50%
Limited Vocabulary Mastery	3	27.30%
Requires Special Attention	1	9.10%

In-depth analysis of students' initial letter recognition and vocabulary skills data revealed that 45.5% of students had difficulty recognizing and distinguishing certain letters, especially consonants that have similar shapes such as 'b' and 'd', and 'p' and 'q'. This percentage indicates the urgency to implement more effective and adaptive learning strategies. Observations also identified that 27.3% of students showed limitations in mastering basic vocabulary that should have been mastered at grade 1 level, while one student required special assistance in the learning process. Regarding the availability of infrastructure and supporting resources, SD Negeri Ngadirejo 04 has adequate basic facilities for the implementation of digital-based learning technology. The school has been equipped with a stable internet network, LCD projector, and audio system funded through the BOS Prestasi program as a driving school. However, the ratio of digital device availability to the number of students still requires optimization to ensure equal accessibility in the implementation of technology-based learning.

Kiddorami Flashcard Implementation Planning Process

The planning of Flashcard Kiddorami implementation began with a comprehensive learning needs analysis. This process involved a multi-dimensional evaluation of pedagogical, technological, and practical aspects to ensure the suitability of the implementation to the learning context at SD Negeri Ngadirejo 04. The needs analysis identified four main dimensions that needed to be addressed in the implementation: improving letter recognition skills, developing vocabulary, optimizing learning motivation, and creating interactive learning experiences. Mapping of school resources and infrastructure was carried out systematically to identify the capacity and limitations in implementing AR technology. The mapping results showed that the school had basic infrastructure readiness that included internet connectivity with a bandwidth of 20 Mbps, three laptops that could be used for learning, and an adequate visual projection system. The technical evaluation confirmed the compatibility of the existing infrastructure with Flashcard Kiddorami's operational needs, although some optimization was needed to maximize the effectiveness of the implementation.

The preparation of integrated teaching modules is carried out by considering the principles of technology-based learning and the specific needs of grade 1 students. The learning module is designed with a scaffolding approach that allows for a gradation of difficulty levels according to the individual abilities of students. The module structure includes three main components: letter recognition through AR visualization, contextual vocabulary development, and interactive activities that support comprehensive

understanding. The strategy for implementing learning media is developed by considering the learning characteristics of grade 1 students and identified technical limitations. The implementation is designed in a small group learning format that allows for structured rotation of access to AR technology. This approach considers the limited number of devices while maximizing each student's exposure to learning media. This strategy also includes a continuous monitoring and evaluation mechanism to ensure the effectiveness of the implementation.

Principal and institutional support is a crucial factor in implementation planning. Principals demonstrate commitment to learning innovation through the allocation of prioritized resources for the development of learning technology infrastructure. Institutional support is also reflected in policies that facilitate teacher professional development in the use of AR-based learning technology. This commitment is manifested in the form of providing a special budget for the procurement and maintenance of digital learning media, as well as facilitating ongoing training for educators. The planning process also integrates evaluation and adaptation mechanisms that allow for adjustments to implementation based on feedback and ongoing observation results. The monitoring system is designed to measure the effectiveness of implementation from various aspects, including improving student literacy skills, levels of engagement in learning, and the efficiency of using AR technology in the context of grade 1 learning.

Kiddorami Flashcard Implementation Mechanism in Learning

Based on the results of learning observations in class 1 of Ngadirejo 04 Elementary School, the application of Augmented Reality (AR)-based Kiddorami flashcards for letter and vocabulary recognition shows a systematic application pattern. The results of interviews with the principal and class teachers revealed that this media supports the Indonesian language learning process, especially in letter recognition and basic vocabulary development. The application of Kiddorami Flashcards in learning is carried out through three main stages. The first stage is basic letter recognition using physical cards, where the teacher introduces the letter shapes and their sounds. The second stage is strengthening understanding through AR visualization, where each scanned letter card displays an example of an object that begins with that letter in the form of 3D animation. For example, the letter card 'A' when scanned will display a visualization of "apple" which can be explored from various angles. The third stage is vocabulary introduction, where students not only see the visualization of the object but are also invited to say the word that matches the object.

Technically, the learning process uses an Instagram filter integrated with Kiddorami Flashcards. The teacher scans the card using a tablet or smartphone, then displays the scan results to students in small groups. Each learning session is designed with a duration of 35 minutes, covering basic letter recognition, card scanning for 3D visualization, and word pronunciation practice. This method allows students to see the direct relationship between letters, visual shapes of objects, and spoken words, creating a comprehensive learning experience in letter recognition and vocabulary. The observation results also showed that the use of AR-based flashcards created a responsive learning environment. Students showed active involvement in the learning process through three levels of interaction: visual observation of letters and objects, digital manipulation of 3D objects, and verbal articulation of the vocabulary being learned. Interactive features such as 3D object rotation and exploration of visual details helped students understand the relationship between letters and words more concretely. The principal confirmed that stable internet

connectivity supported the smooth implementation of media in the process of recognizing letters and vocabulary.

Student Response and Engagement

Analysis of the implementation of AR-based Kiddorami Flashcards shows significant effectiveness in achieving the objectives of letter recognition and vocabulary enrichment of grade 1 elementary school students. Through interactive 3D visualization, students show better abilities in identifying and understanding the relationship between letters and their object representations. When scanning the cards, students not only recognize the shape of the letters, but also actively explore the relationship between the letters and the words represented, such as identifying the relationship between 'A' and the visualization of 'Apple' which appears in the form of 3D animation.

The success of the media in supporting letter and vocabulary recognition is reinforced by the high level of student involvement in the learning process. Students show enthusiasm in exploring 3D visualizations and actively make connections between letters and the objects represented. Dynamic interaction with AR media creates a multisensory learning experience that helps students, especially those who previously had difficulties, in building a stronger understanding of letters and vocabulary. Although there is variation in the speed of mastery between individuals, in general students show progressive development in their ability to recognize letters and enrich their vocabulary through the use of this learning media.

The formation of spontaneous collaboration between students in exploring and discussing AR content also supports the effectiveness of letter and vocabulary recognition. Students share experiences and actively comment on the relationship between letters and the visualizations that emerge, creating a learning environment that supports early literacy development. This increased active engagement strengthens the learning process and students' understanding of the material being taught.

Identification of Supporting and Inhibiting Factors

The results of the study identified several supporting and inhibiting factors in the implementation of Augmented Reality-based Kiddorami Flashcards at SD Negeri Ngadirejo 04. In the context of internal supporting factors, the study found strong institutional support from the principal through the availability of adequate basic infrastructure and a positive response from the learning community. In addition, a positive response from the learning community was also a significant supporting factor, marked by students' high enthusiasm in learning and their active involvement when interacting with 3D visualizations. In terms of external supporting factors, the study revealed that the accessibility of AR technology was a key factor in the success of the implementation. This is shown through the ease of access provided by Instagram filters and supported by stable internet connectivity. Technical support from Kiddorami developers also contributed significantly to facilitating the implementation of this technology in learning.

In terms of inhibiting factors, the study identified several significant technical and operational constraints. Limited digital devices were the main obstacle, where students had to take turns in the scanning process, and faced limited access to view all available flashcards. Time constraints are also substantial inhibiting factors, including the scanning process that takes a long time, limited time for individual exploration of AR visualization, and the complexity of time management for rotating technology access. To overcome these

various constraints, several adjustments have been made in the implementation of Flashcard Kiddorami. These adjustments include the implementation of a learning rotation system, optimization of the use of projectors for collective visualization, and the development of parallel learning activities. The results of the study showed that despite several technical and operational constraints, the existence of strong supporting factors allowed the implementation of Flashcard Kiddorami to continue to run effectively in the context of learning at SD Negeri Ngadirejo 04.

Solutions to Overcome Inhibiting Factors

Based on the results of research conducted at SD Negeri Ngadirejo 04, several comprehensive solutions were found to overcome the inhibiting factors in the implementation of Flashcard Kiddorami based on Augmented Reality (AR). Data obtained from the principal and teachers showed that the main solution was related to improving the technology infrastructure in schools. This solution includes the addition of supporting devices such as laptops and projectors, as well as improving the quality of internet connections to facilitate the use of AR in a classical manner. The use of projectors is a key solution that allows AR visualizations to be displayed to the entire class simultaneously, thereby reducing waiting time in the learning process. In terms of optimizing learning media, the results of the study showed the importance of optimally utilizing learning media that are already available in schools. The principal emphasized the need to select new learning media that are in accordance with the times, but still consider their suitability for learning materials and student characteristics. This shows that the effectiveness of using learning media does not only depend on the sophistication of technology, but also on the accuracy of its selection and use.

Regarding institutional support, the results of the study revealed that schools prefer AR-based learning media that are affordable and easy to use such as Flashcard Kiddorami. The school's commitment to optimizing the use of learning media that is already available is also an important factor in overcoming obstacles to the implementation of AR technology. The selection of learning media is adjusted to the needs and capabilities of the school, considering economic and practical aspects in its implementation.

Discussion

The implementation of Augmented Reality (AR) based Kiddorami Flashcards at SD Negeri Ngadirejo 04 resulted in a significant transformation in Indonesian language learning, especially in the aspects of letter recognition and vocabulary development in grade 1 students. The findings of this study show convergence with the results of the study [16] which confirms the effectiveness of flashcards in improving students' attention and focus in vocabulary learning. Furthermore, observations regarding the increase in students' active engagement through AR technology support the findings. [17] about the transformative potential of technology-based learning media in increasing student participation in early literacy stages. Analysis of the initial learning conditions revealed substantial challenges in basic literacy, with 45.5% of students experiencing difficulties in letter recognition. This finding is in line with research [18] which emphasizes the urgency of diversifying learning media to optimize learning outcomes at the elementary school level. The implementation of Kiddorami Flashcard provides an innovative solution through the integration of AR technology, creating a more dynamic and interactive learning experience as validated by [19] in their study of interactive approaches to elementary literacy learning.

The transformation of learning methodology through AR implementation showed a positive impact on student motivation and engagement. There was a marked increase in active participation, observations also showed that this interaction sparked discussion among students, creating a collaborative and dynamic learning atmosphere. [20] about the potential of AR technology in creating meaningful learning experiences. Observations of changes in student learning behavior also support the research results. [21] which identified a positive correlation between the implementation of learning technology and the improvement of the quality of interaction and conceptual understanding of students. The technical aspects of the implementation of Kiddorami Flashcards showed complexity that was in line with the findings. [22] about the importance of continuous adaptation in the implementation of educational technology. Identified technical barriers, such as device limitations and connectivity fluctuations, reflect observations [23] regarding the infrastructure challenges in integrating educational technology at the elementary school level. However, the adaptive solutions developed, including a learning rotation system and collective visualization optimization, demonstrate the validity of the approach proposed by [24] on the importance of flexibility in implementing learning technology.

The success of the implementation of Kiddorami Flashcards cannot be separated from strong institutional support, as emphasized by [25] in their research on the synergy of technological infrastructure and pedagogical support. This finding is reinforced by [26] which underlines the role of motivation in encouraging active student participation in technology-based learning. Institutional commitment demonstrated through the provision of infrastructure and teacher capacity development is in line with the recommendations [27] about the importance of a holistic approach in implementing learning innovations. The pedagogical aspects of the implementation of Kiddorami Flashcards show alignment with the principles of constructivist learning as proposed by [28]. The integration of AR technology in language learning supports the development of cognitive abilities through multi-sensory experiences, in line with findings [29] on the effectiveness of immersive learning in elementary education. Observations of increased peer-to-peer interactions confirm the perspective [30] about the role of technology in facilitating collaborative learning.

The implementation dynamics identified in this study underscore the importance of a systemic approach to the integration of learning technologies, as emphasized by [31]. The supporting and inhibiting factors identified show a complexity that is in line with observations. [32] about the multidimensionality of challenges in implementing educational technology. The adaptive solutions developed reflect the recommendations [33]about the importance of creativity in optimizing learning resources. The theoretical and practical implications of this study contribute significantly to the understanding of the implementation of AR technology in language learning at the elementary school level. The findings of the study confirm the observations [34] about the transformative potential of immersive technologies in primary education, and supports the argument [35] about the urgency of technology integration in the development of digital literacy. Furthermore, the results of this study enrich the academic discussion on learning innovation as proposed by [36] in their study of pedagogical transformation in the digital age.

In conclusion, the implementation of AR-based Kiddorami Flashcards demonstrated transformative potential in Indonesian language learning at the elementary school level. The successful implementation confirmed the validity of the immersive technology approach in elementary education, while underscoring the importance of contextual

considerations and continuous adaptation. The findings of this study provide an empirical basis for the development of more comprehensive technology-based learning models in the future, while highlighting areas that require further attention and development. The implementation of AR-based Kiddorami Flashcards also showed significant impacts on the development of teachers' pedagogical competencies. Through this implementation process, teachers experienced a transformation in their teaching approaches, moving from traditional instructional models to more interactive and student-centered learning facilitation [37]. Observations showed that teachers developed adaptive skills in integrating technology with conventional learning strategies, creating a learning environment that was more dynamic and responsive to students' individual needs.

The psychological aspect of learning also underwent significant transformation through the implementation of Kiddorami Flashcards. Students showed increased self-confidence in language learning, as reflected in their willingness to actively participate in class discussions and learning activities. Increased intrinsic motivation was evident from students' enthusiasm in exploring AR features and their desire to engage in independent learning. Observations also revealed that students who previously showed anxiety in language learning began to demonstrate a more positive and open attitude towards the learning process. The social dimension of learning underwent positive changes through the implementation of AR technology. Learning interactions were no longer limited to teacher-student communication, but evolved into a more complex network of interactions involving collaboration between students. The formation of informal study groups and increased peer-to-peer communication demonstrated that AR technology could serve as a catalyst for collaborative learning. Students spontaneously shared their knowledge and experiences, creating a more dynamic and supportive learning community.

The effectiveness of Flashcard Kiddorami implementation is also seen in the cognitive aspect of learning. The 3D visualization and interactivity offered by AR technology help students build a more concrete understanding of abstract concepts in language learning. The ability to manipulate virtual objects and see visual representations of linguistic concepts helps students develop a deeper and more lasting understanding. Observations show that students are better able to remember and apply the knowledge gained through this immersive learning experience. The classroom management aspect has also been transformed through the implementation of AR technology. Teachers developed new strategies in organizing learning, including the formation of rotation groups that allow equal access to AR technology. This management system not only ensures efficient use of resources but also creates a more organized and predictable learning structure for students. The development of clear classroom routines for the use of AR technology helps minimize distractions and maximize effective learning time. The implementation of Flashcard Kiddorami also provides valuable insights into the potential of AR technology in supporting learning differentiation.

The ability to adjust the level of difficulty and pace of learning according to the individual needs of students allows for a more personalized approach to language learning. Observations show that students with different levels of ability can access and understand learning materials according to their own pace and learning style. Transformations in learning assessment were also identified through the implementation of AR technology. Teachers developed more holistic evaluation methods that did not only focus on the final results, but also considered the learning process and overall development of students' abilities. Observations of students' interactions with AR technology provided valuable insights into students' learning strategies and conceptual

understanding that may not be visible in traditional assessment methods. The sustainability dimension of AR technology implementation was also the focus of analysis in this study. Institutional capacity development, including improving technology infrastructure and staff competency development, was a key factor in ensuring the sustainability of this learning innovation. Strong institutional commitment to technology integration in learning, reflected in resource allocation and development of supporting policies, provided a solid foundation for further development in the future.

CONCLUSION

This study proves that the use of Augmented Reality (AR)-based Kiddorami Flashcards in Indonesian language learning at SD Negeri Ngadirejo 04 is able to bring positive transformations in teaching methods in elementary schools. Through an interactive approach with 3D visualization, learning becomes more interesting, significantly increases students' letter and vocabulary recognition, and encourages their active involvement in the learning process. In planning, in-depth needs analysis and the preparation of learning modules that are in accordance with the curriculum are very important to integrate technology-based media effectively. Implementation is carried out with a small group learning approach, using 3D visualization through Instagram filters, which creates a fun learning experience and motivates students to be more active.

Several supporting factors in the success of this implementation include institutional support through the provision of technology infrastructure from BOS funds, a stable internet connection, and student enthusiasm for the use of technology in learning. However, there are obstacles such as long scanning times, limited individual access to flashcards, and short exploration time for AR visualization. To overcome these challenges, the solutions implemented include the use of projectors as the main media, optimization of existing infrastructure, and teacher training in utilizing educational technology to the maximum. The results of this study indicate that the integration of AR in Indonesian language learning can bring positive changes in teaching methods in elementary schools, making the learning process more interactive, inclusive, and technology-based.

For further research, it is recommended that exploration of AR usage not only focus on letter and vocabulary recognition, but also on the development of more complex literacy skills, such as reading and writing comprehension. In addition, research can expand the age range of students, for example to higher grade levels or even inclusive education, to test the effectiveness of AR technology in a broader learning context. Further research can also explore the development of more interactive AR features, such as gamification or personalization of learning, so that it can provide a more engaging and adaptive learning experience to the needs of each student.

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