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Application of Assemblr Edu Augmented Reality Media in Science Learning on Water Cycle Material at Wonosari 01 State Elementary School

Vera Amelia(*) & Barokah Isdaryanti
Elementary School Teacher Education, Semarang State University, Indonesia

Abstract

Science Learning can foster students' curiosity about their surroundings. It is essential to be taught in elementary school. However, based on the observations at Wonosari 01 State Elementary School, researchers obtained data that there was still a lack of student interest in science learning subjects because, during learning, the teacher did not use learning media, so students became less active in participating in learning. This also impacts student learning outcomes, which are still relatively low. Researchers collaborate with classroom teachers in improving learning activities in the classroom. Researchers and class teachers use Augmented Reality Assemblr Edu learning media with water cycle material in science subjects. This research uses the Classroom Action Research method proposed by Kemmis and Taggar. This Classroom Action research method was conducted in two cycles. The results of this study indicate an increase in the average student learning outcomes, wherein each cycle, student learning has increased from 83.46% in cycle I and 92.69% in cycle II. This is also shown in the percentage of completeness of student learning outcomes, which is increasing from cycle I with a rate of completeness of 84.61% and a percentage of 15.38% unsuccessful. While in cycle II, the percentage of completeness was 96.15%, with a percentage of unfinishedness of 3.84%. Based on the data obtained, the researcher's goal of applying Augmented Reality Assembly Edu learning media to improve student learning outcomes in science learning subjects has been proven successful.

Keywords: Augmented Reality, Edu Augmented Reality, Water Cycle

(*) Corresponding Author: veraameliamanggar@students.unnes.ac.id

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INTRODUCTION

Education is one of the most critical aspects of the development of society and individuals (Ningrum, 2016). In the digital era, technology is becoming increasingly important in facilitating learning (Agustian & Salsabila, 2021; Berliana et al., 2021). However, based on survey data on primary school learning media use in Central Java, 63% of schools use offline learning media, and 37% use offline and online learning media (Azis & Febriana, 2023). In addition, based on observations made by researchers at Wonosari 01 State Elementary School for fifth-grade students, several obstacles are experienced during the learning process. One of them is the use of inadequate learning media. This is also supported by the results of interviews that researchers have conducted with class teachers. The teacher stated that when students are given explanations about learning without concrete media, they find it challenging to pay attention to learning. Learning at SD Negeri Wonosari 01 is considered less than optimal due to students' lack of guidance and interaction with real-world objects and environments. This causes students to struggle to understand learning, especially in science learning subjects. Thus, it can be concluded that the problem at Wonosari 01 State Elementary School is the lack of learning media

innovation at Wonosari 01 State Elementary School and the limited attractiveness of educators to attract students' attention to science learning materials in Class V.

Augmented Reality (AR) is one of the technologies that has shown great potential in improving learning effectiveness. The use of AR in education has attracted the attention of researchers and educators, including, according to (Wardani, 2015), Augmented Reality (AR) is a technology that can integrate two-dimensional or three-dimensional virtual objects into the natural environment in real-time. This three-dimensional media can visualize abstract objects so that they look as if they are real and can be displayed around the user. There are main characteristics of Augmented Reality, namely (1) the merger between the real and virtual worlds, (2) interactive in real-time, and (3) the ability to be displayed in three-dimensional form. The thing that distinguishes Augmented Reality Assembly Edu from others, such as Powton, is that Powton is an interactive animated video that cannot be displayed in 3D., as well as the Prezi application, which is used to create and manage presentations with flexible and dynamic displays. Assemblr Edu Augmented Reality can support teachers in creating exciting learning activities by utilizing 3D mode (Carrion-Robles, Espinoza-Celi, & Vargas-Saritama, 2023; Enzai et al, 2021; Nevarini, Agustiani, & Zahra, 2023)). This platform has file upload, note writing, visual sharing, and 3D creation application features that can be applied in the classroom. AR-based learning media such as Assemblr Edu can provide a more interactive and exciting learning experience. The water cycle material is also one of the essential meanings in science learning in elementary school because a deep understanding of the water cycle is critical for understanding more contextual scientific concepts in the future. Therefore, developing augmented reality-based learning media focusing on this material can significantly benefit the educational process.

Based on previous research conducted by Setyawan et al. (2019) entitled "Augmented Reality in Science Learning for Elementary Students," shows that students' concept understanding in science learning is still not optimal. There are similarities between the research of Setyawan et al. (2019) and the researcher's research, namely, the use of augmented reality media. The difference is that Setyawan et al. (2019) used the type of Research and Development (R&D) research with the Unity application on space exploration material in grade VI. At the same time, this research focuses on water cycle material in grade V with the type of Classroom Action Research using Assemblr Edu.

Previous research conducted by (Hikmah et al., 2023) entitled "3D Media Development of Human Hearing Senses Material with Augmented Reality Assemblr Edu" has similarities with researcher research on using Assemblr Edu as a learning media. While the differences are that the material studied is different, the classes taken are different, and the types of research are different. The research (Hikmah et al., 2023) examined human hearing sense material in grade IV with the kind of Research and Development (R&D) research. Meanwhile, the researcher used classroom action research to study water cycle material in grade V.

Research conducted by Sugiarto (2022), entitled "The Use of Augmented Reality Assembly Edu Media to Improve Understanding of Blood Circulation Concepts," shows similarities with researcher research, namely using Augmented Reality Assembly media with qualitative research methods. The difference is that the research focuses on blood circulation material in class VII, while this research focuses on water cycle material in class V. Research conducted by Alfitriani et al. (2021) entitled "The Use of Augmented Reality Media in Learning to Recognize the Shape of the Earth" shows similarities with researcher research, namely using Augmented Reality media with qualitative research methods. However, the difference is that the research focuses on the material of the earth's shape, while this research focuses on the material of the water cycle in class V.

Based on identifying these problems, this research problem is formulated 1). How can the application of Augmented Reality Assembly Edu media improve students' understanding of water cycle material at Wonosari 01 State Elementary School? 2) How do students respond to the use of Augmented Reality learning media in science learning? 3) What are the supporting and inhibiting factors in applying Augmented Reality learning media in SD Negeri Wonosari 01?

The main objective of this research is to implement Augmented Reality-based learning media using the Assemblr Edu platform and measure its impact on students' understanding of the water cycle in grade V of SD Negeri Wonosari 01. This research also aims to evaluate how much Augmented Reality can increase student interest in learning and involvement in science learning subjects.

Based on the problems described, researchers are interested in conducting research and development titled "Application of Augmented Reality Assembly Edu Learning Media in Science Learning on Water Cycle Material at Wonosari 01 State Elementary School". Thus, this research seeks to contribute to developing technology-based education at the primary level and provide a more in-depth view of the effectiveness of using AR (Augmented Reality) in learning scientific materials.

METHODS

The method used in this research is a qualitative approach. Research with a qualitative approach aims to holistically understand phenomena experienced by research subjects, such as behavior, perceptions, motivations, and actions, by describing them in words and language in a unique natural context and using various natural methods (Moleong, 2017). Hendriyadi et al. (2019) state that qualitative research is a naturalistic process aiming to understand social phenomena in depth and naturally.

The type of research used is Classroom Action Research, which aims to develop the most efficient and effective learning strategies in a natural situation, not in an experimental context. Action research believes knowledge can be built through experience, especially experience gained through action. Based on this assumption, every individual has the opportunity to improve their abilities through research actions. Researchers involved in action research are assumed to have the skills to change the conditions, behavior, and abilities of the subjects (students) who are the focus of the study.

In this study, researchers used two types of data sources. First, primary data sources refer to information obtained directly by data collectors through tests conducted on grade V students. Second, secondary data sources involve support from various materials related to the subject, such as science learning books, learning models, articles, reviews, science learning textbooks for grade V students, and classroom action research books.

This research process began with the first cycle, which consisted of four stages: planning, implementation, observation, and reflection. If, in the initial cycle, there were research problems that had not been resolved, the author continued to the next cycle until the problem could be resolved. By referring to the research process, classroom action research in improving the learning outcomes of grade V students begins with planning, action implementation or processing, and observation, followed by the reflection stage. Suppose student learning outcomes are considered less than optimal after the reflection and data collection stages. In that case, the next step is to take action in the next period of the learning cycle to maximize students' critical thinking skills. The research design can be described in Figure 1.

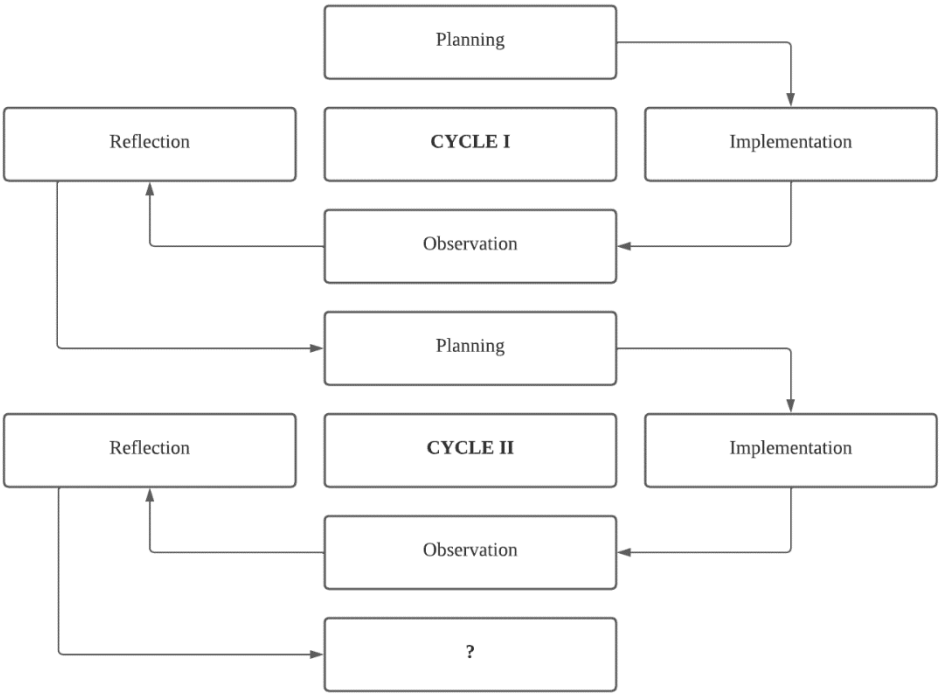

Figure 1. Classroom Action Research Cycle
Source: (Arikunto, et al. 2017: 42)

Steps are taken based on the results of initial observations to implement this action. These observations form the basis of the action plan, where problems are identified. Furthermore, action is taken to find the right solution to solve the issue at hand, and the solution is suitable to be applied in the context of this study. As for the planning stage, the first step was to reach a common perception by discussing science learning on water cycle material with the class teacher. The second step involves making teaching modules that use the Problem-Based Learning model for the material. Furthermore, the third step is compiling an observation sheet, followed by the fourth step, compiling a Learner Worksheet tailored to the teaching material to evaluate student learning outcomes. The fifth step includes preparing learning media that will be used during the learning process. The sixth step is to develop assessment instruments to record and analyze data related to the process and results of the implemented actions. The seventh step involves preparing documentation tools for learning activities, such as taking photos.

Data collection techniques in this study were structured participant observation and semi-structured interviews. The stages of data analysis are described in Figure 2.

Data collection in the form of direct observation; 2) Data reduction by making observation notes; 3) Presentation of data by displaying data as a follow-up to achieve research objectives; 4) Drawing conclusions or verification with data that has been obtained and supported by evidence found by researchers when returning to the field.

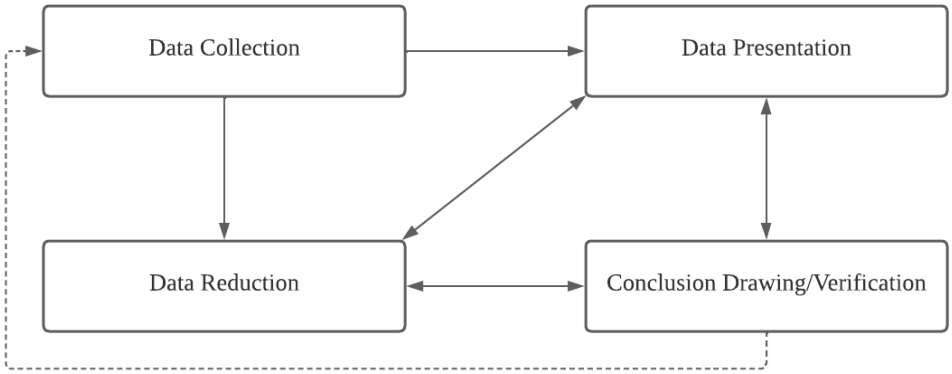

Figure 2. Data Analysis Model in this Study
Source: Adaptation of Miles, Huberman, & Saldana (2014)

RESULTS & DISCUSSION

Table 1. Criteria for Student Learning Success Level in %

Interval Percentage of Mastery Level	Value Scale	Description
85% - 100%	A	Very good
75% - 84%	B	Good
60% - 74 %	C	Enough
40% - 59%	D	Less
0% - 39%	E	Fail

(Source: Sunarti, 2014: 191)

The data obtained in this study involved observations of student learning activities, observations of teacher teaching activities, and student learning outcomes. The data collection results through observation and student learning tests showed several findings. In cycle I, the results of student activity observations reached an average score of 83.46% with suitable criteria. While in cycle II, the average score of students increased to 92.69% with excellent criteria. This increase reflects that the teacher's activities have progressed, which is reflected in the management of a more pleasant class and the ability to increase student learning activity.

The following are the differences between the research results of Cycle I and Cycle II:

Table 2. Cognitive Learning Outcomes

No	Learning Completeness	Cycle I	Cycle II
1.	Minimum score	70	70
2.	Maximum score	100	100
3.	Percentage of non-completion	15,38%	3,84%
4.	Percentage of completeness	84,61%	96,15%
5.	Average score	83,46	92,69

Second, the observation results of the teacher's teaching activities showed that in cycle I, an average score of 60.71% was obtained with sufficient criteria. There was a significant increase in cycle II, with an average score of 92.85% with excellent criteria. This increase reflects improvements in classroom management, creating a more pleasant atmosphere and increasing student learning activity.

The results of student learning evaluations showed that in cycle I, the average score was 83.46%, with a percentage of completeness of 84.61%. There was a significant increase in cycle II, with an average score of 92.69% and a percentage of completeness reaching 96.15%. The recapitulation of the results of observations of student and teacher activities related to the application of learning with Augmented Reality Assembly Edu media to improve student science learning outcomes in grade V of Wonosari 01 State Elementary School from cycle I to cycle II obtained the following observation results.

Table 3. Recapitulation of Observation Results of Student and Teacher Activities (Cycle I and II)

Observation Results	**Cycle I**	**Cycle II**
Student Activity	65 %	85%
Teacher activity	60,71%	92,85%

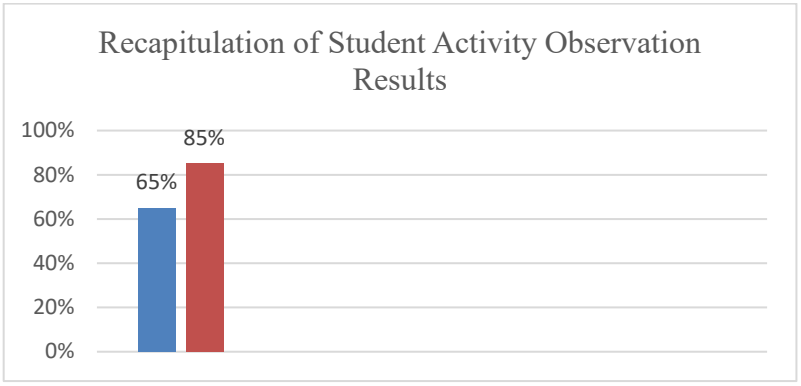

Figure 3. Recapitulation of Student Activity Observation Results

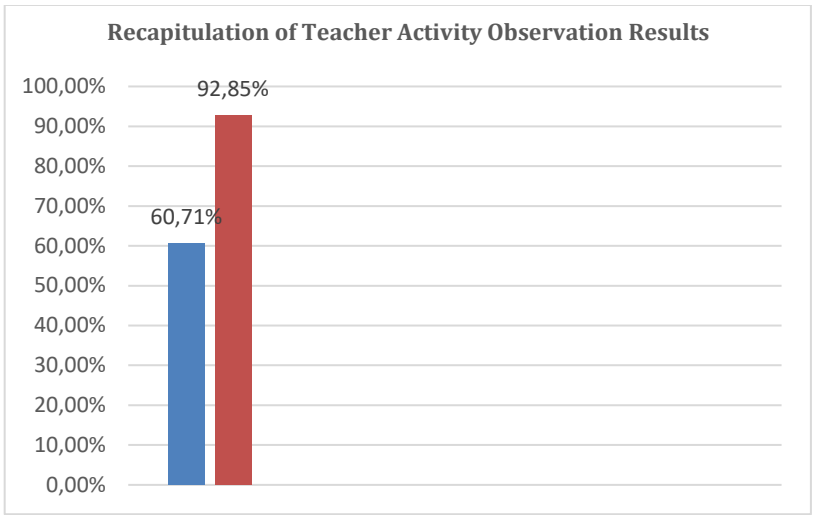

Figure 4. Recapitulation of Teacher Activity Observation Results

Application of Augmented Reality Assembly Edu Media in Science Learning on the Material of the Water Cycle of Grade V SD Negeri Wonosari 01

This study uses qualitative research methods, with classroom action research conducted in two cycles. Each cycle consisted of one meeting. Before starting the cycle, researchers conducted a pre-cycle through a pretest to determine the learning outcomes of science learning subjects in grade 5, especially on water cycle material. The pretest activities showed that all students, namely 100% of the 26 learners, did not meet the Minimum Achievement of Learning Goals, with an average score of 41.15.

Based on this research, it can be concluded that the observations made during the preliminary study and pre-cycle showed inferior results in achieving student learning outcomes through pretests. The average value of student learning outcomes in the pretest was 41.15, while the Achievement of Learning Goals for grade 5 science learning subjects at Wonosari 01 State Elementary School was 75. The value is far below the standard or minimum limit set. This is due to the application of the learning process, which is still passive and teacher-centered, and the limited use of learning media to understand the material during the teacher's explanation.

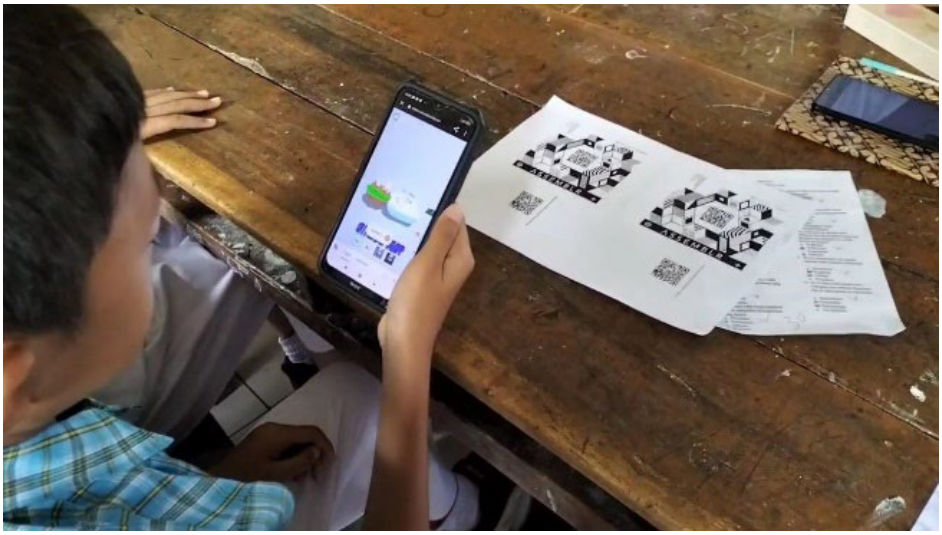

Figure 5. Application of Learning with Augmented Reality Assembly Edu Media

Cycle I

In the learning stage, researchers carry out learning by the plan that has been prepared. The activity begins with a prayer together, followed by student attendance, apperception, motivation, and learning objectives. In the core activities, researchers provide learning materials to students using Augmented Reality Assembly Edu learning media, which supports students' understanding of the material. The learning approach is focused on students, where students' steps involve explaining the material to peers using charts or concept maps. In cycle I, students still lacked the confidence to express their opinions actively.

Then, the teacher motivated student involvement through group activities to discuss the problems in the Learner Worksheet. Students still face obstacles to collaboration; not all students focus on their groups. Before ending the learning session, researchers gave evaluation questions to measure students' understanding of the material. During the closing activity, the teacher and students reflected on the material that had been

learned. However, at the closing stage, students were still less enthusiastic in reflecting because they were still adapting to the learning model introduced by the researcher.

In this first cycle, the teacher did not arouse students' curiosity to ask questions, did not attract students' attention to focus on learning, and did not encourage students to be actively involved in explaining the material to peers after understanding it. Although there are already students who dare to come forward to explain the material, their confidence level still needs to be improved. This caused the delivery of material by these students to be not optimal to their friends.

Cycle II

As for Cycle II began with introductory activities with prayers together, then continued with student attendance, apperception, motivation, learning objectives, and ice-breaking shoot dor. The core learning process in this cycle experienced an increase, seen from the increasing confidence of students, where they boldly took the lead in explaining understanding to other friends. Researchers used Augmented Reality Assembly Edu media to explain the material during core activities. Furthermore, students were divided into small groups of 6-7 people, and each group had a peer tutor who helped with their friends' learning process.

In the final activity, the researcher guided students in concluding, providing opportunities for students who still did not understand to ask questions. In cycle II, significant progress was seen, such as changes in the attitude of students who were initially passive to active, the emergence of curiosity, which was previously lacking, and student involvement in the group. During cycle II, students showed progress in listening when the teacher spoke, although they still needed further guidance to create a more conducive classroom atmosphere. In the closing activity, students began to express their feelings regarding the learning process that had taken place.

Improved Learning Outcomes of Grade V SD Negeri Wonosari 01 in Science Learning with Assemblr Edu Augmented Reality Media

Based on the results of observations made by researchers in class V SD Negeri Wonosari 01, the conclusion has successfully applied Augmented Reality Assembly Edu learning media in science learning subjects of water cycle material by these learning steps. This can be seen from the increase in student activity and teacher activity in the learning process from before and after action using the application of Augmented Reality Assembly Edu learning media from cycle I to cycle II.

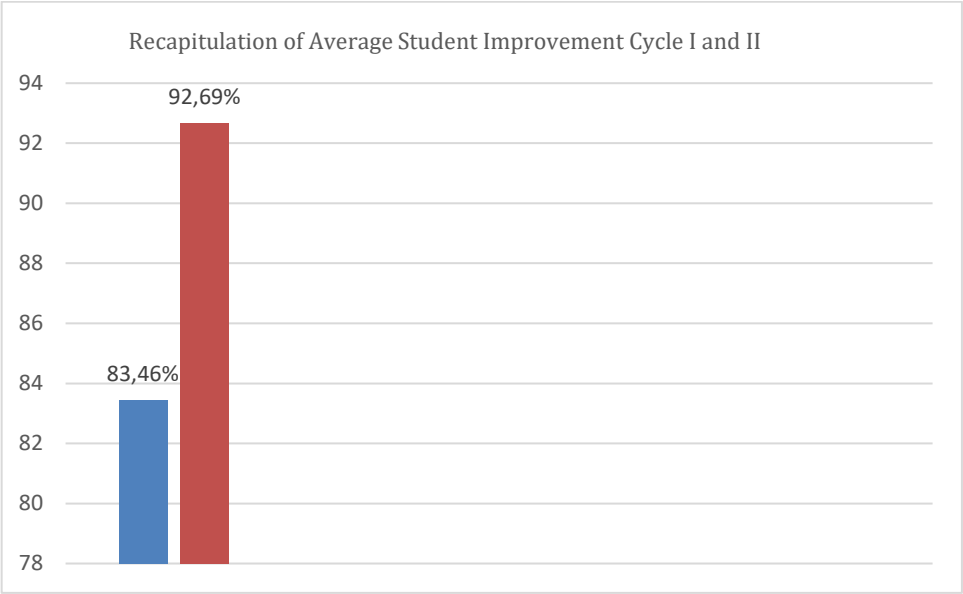

Figure 6. Recapitulation of Average Student Improvement in Cycles I and II

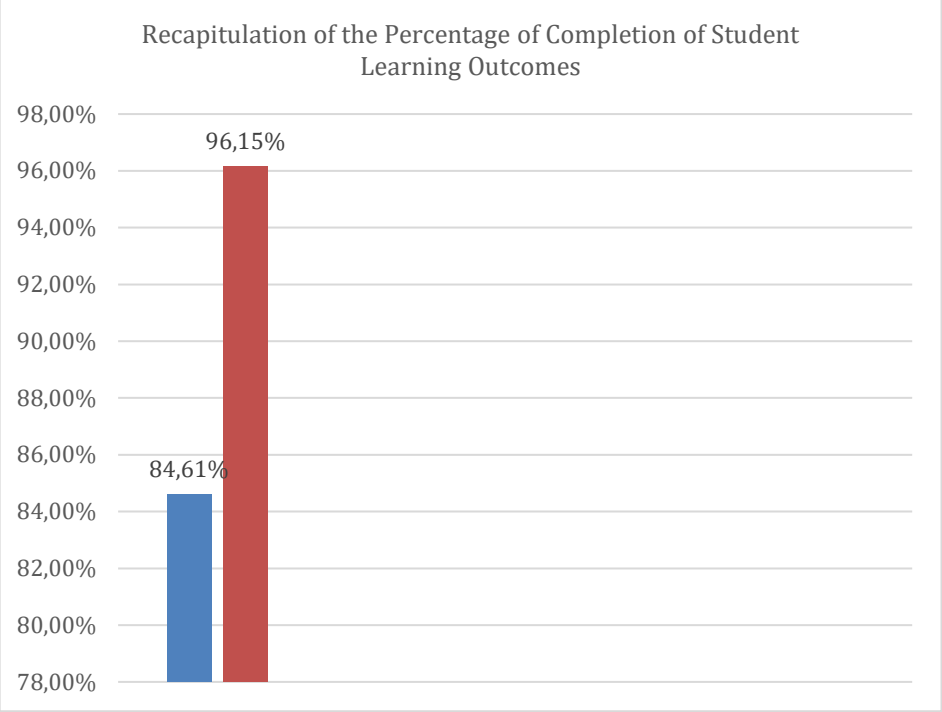

Figure 7. Recapitulation of the Percentage of Student Learning Outcomes Completion Cycle I and II

The data above shows an increase in the average student learning outcomes, wherein each cycle, student learning has increased from 83.46% in cycle I and 92.69% in cycle II. This is also shown in the percentage of completeness of student learning outcomes, which is increasing from cycle I with a rate of completeness of 84.61% and a percentage of 15.38% unsuccessful. In cycle II, the percentage of completeness was 96.15%, with a 3.84% percentage unsuccessful.

Student Response

"Does this Augmented Reality learning media make it easier to understand the material taught?" Learners said this learning media can make it easier for students to understand the material because they can learn new things in 3D. "Is the water cycle material presented with Assemblr Edu Augmented Reality media easy to understand and exciting?" All students said it was easy to understand because learning with 3D could feel concrete. "Does learning with Augmented Reality Assembly Edu media increase your motivation in learning science?" Learners said yes because they use cell phones to be creative in learning. "Does the Augmented Reality Assembly Edu media train you to think critically, creatively, and systematically and understand concepts that are relevant in the environment?" Learners said, "Yes, because of the 3D media, they can move and explain the Augmented Reality Assembly Edu media as in the surrounding environment". "Does the Augmented Reality Assembly Edu media increase your confidence in learning science?" Learners answered that they are more confident now because the models and media are fun and easy to understand.

Based on the explanation above, it can be said that student's responses to the application of Augmented Reality Assembly Edu learning media in science learning subjects are excellent; this is evidenced by the results of the average student response questionnaire in cycle I, namely 82.50% and cycle II, namely 95.76%. The response that 3D media is beneficial in the learning process is in line with previous research (Sugiarto, 2022), which states that students find it easy to understand the material because 2D images that have been in the package book become more concrete and can move when scanned using Assemblr Edu. Learners who like to use cell phones can be creative in learning to provide motivation. When students enjoy learning, it will impact their understanding, undoubtedly impacting the value of knowledge, skills, and attitudes.

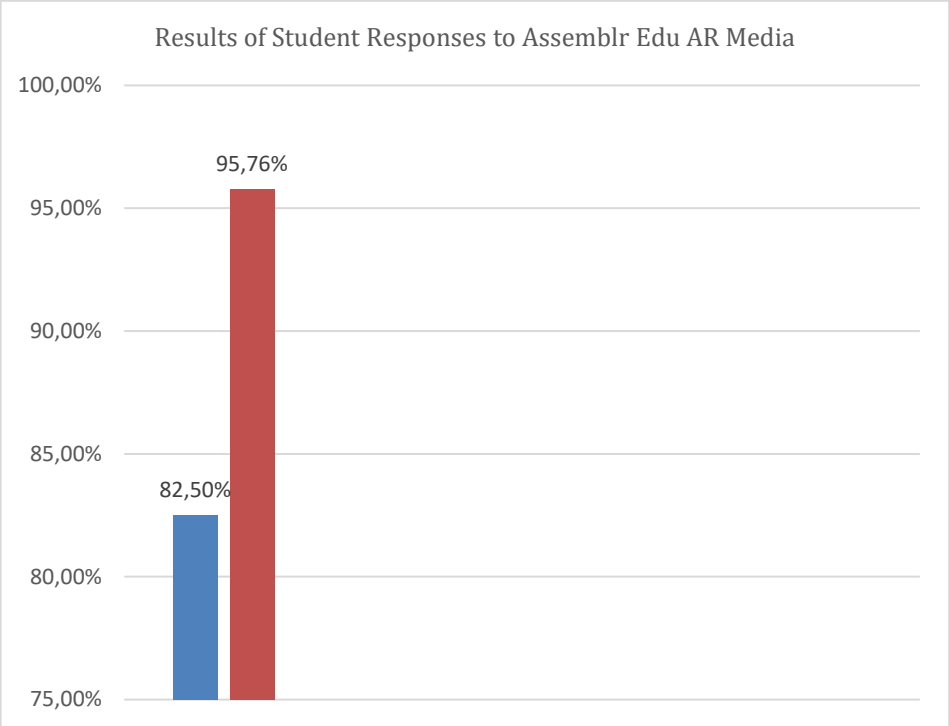

Figure 8. Results of Student Responses to Assemblr Edu AR Media

CONCLUSION

Based on classroom action research conducted by researchers to improve student learning outcomes using Augmented Reality Assembly Edu learning media in class V science learning subjects at Wonosari 01 State Elementary School, it can be concluded that the learning implementation process changes the role of the teacher to a facilitator who encourages students to convey and develop teaching materials independently after initial explanation by the teacher. The learning process involves students actively, not monotonously because student involvement creates a lively, fun learning atmosphere and encourages two-way communication. With students' positive responses, the teacher's role as a guide and motivator makes the learning process more enjoyable. Based on the observations of student and teacher activities, this study proves successful in improving student learning outcomes in science learning class V subjects at Wonosari 01 State Elementary School. Student learning outcomes with the application of Augmented Reality Assembly Edu learning media have increased in line with the learning test results obtained, indicating that the application of the learning model contributes to improving learning outcomes. Therefore, it can be concluded that the results of this study succeeded in improving student learning outcomes in science learning subjects in class V SD Negeri Wonosari 01 Augmented Reality Assembly Edu learning media.

REFERENCES

Agustian, N., & Salsabila, U. H. (2021). Peran teknologi pendidikan dalam pembelajaran. *ISLAMIKA, 3*(1), 123-133. https://doi.org/10.36088/islamika.v3i1.1047

Alfitriani, N., Maula, W. A., & Hadiapurwa, A. (2021). Penggunaan media augmentedreality dalam pembelajaran mengenal bentuk rupa bumi. *Jurnal Penelitian Pendidikan*. 38(1), 30–38.

Arikunto, S. (2017). *Pengembangan Instrumen Penelitian dan Penilaian Program*. Yogyakarta: Pustaka Pelajar.

Azis, D. K., & Febriana, M. (2023). Identifikasi tren media pembelajaran IPA di SD/MI pasca pandemi. *Journal of Science Education*. 7(2), 343–349.

Berliana, A. U., Mailizar, M., Faiza, F., & Leonard, L. (2021). Pengembangan media pembelajaran berbasis android melalui model pembelajaran PAIKEM (pembelajaran aktif, inovatif, kreatif, dan menyenangkan). *Journal of Instructional Development Research, 2*(2), 57–68. https://doi.org/10.61193/jidr.v2i2.14

Carrión-Robles, F., Espinoza-Celi, V., & Vargas-Saritama, A. (2023). The Use of Augmented Reality through Assemblr Edu to Inspire Writing in an Ecuadorian EFL Distance Program. *International Journal of Engineering Pedagogy*, *13*(5).

Enzai, N. I. M., Ahmad, N., Ghani, M. A. H. A., Rais, S. S., & Mohamed, S. (2021). Development of augmented reality (AR) for innovative teaching and learning in engineering education. *Asian Journal of University Education*, *16*(4), 99-108.

Eka Yanuarti. (2017). Pemikiran pendidikan Ki Hajar Dewantara dan relevansinya dengan kurikulum 13. *Jurnal Penelitian*, 11(2), 237–266.

Haryanto. (2020). *Evaluasi Pembelajaran Konsep dan Manajemen*. UNY Press.

Hikmah, S., Kanzunnudin, M., & Khamdun, K. (2023). Pengembangan media 3D materi indera pendengaran manusia dengan augmented reality assembler edu. *Journal on Education*. 5(3), 7430–7439.

Hendryadi., Tricahyadinata, I., & Zannati, R. (2019). *Metode Penelitian*. Jakarta: Pengembangan Manajemen dan Publikasi Imperium..

Lino Padang, F. A., Ramlawati, R., & Yunus, S. R. (2022). Media assemblr edu berbasis augmented reality untuk meningkatkan hasil belajar materi sistem organisasi kehidupan makhluk hidup. *Diklabio: Jurnal Pendidikan dan Pembelajaran Biologi.* (6) 1, 38-46.

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative Data Analysis* (3rd ed.). Thousand OaksL SAGE Publications, Inc.

Moleong. (2017). *Metode Penelitian Kualitatif*. Bandung: Remaja Rosda Karya.

Nevarini, M., Agustiani, R., & Zahra, A. (2023). Application of Augmented Reality in Geometry Learning in Increasing Student Learning Motivation. *Journal of Curriculum and Pedagogic Studies (JCPS)*, *2*(1), 40-50.

Ningrum, E. (2016). Pengembangan sumber daya manusia bidang pendidikan. *Jurnal Geografi Gea, 9*(1). https://doi.org/10.17509/gea.v9i1.1681

Setyawan, B., Rufii, Nf., & Fatirul, A. N. (2019). Augmented reality dalam pembelajaran IPA bagi siswa SD. *Kwangsan: Jurnal Teknologi Pendidikan, 7*(1), 78–90.

Sugiarto, A. (2022). Penggunaan media augmented reality assemblr edu. *Jurnal Guru Inovatif*. 1(2), 1–13.

Sugiyono. (2020). *Metode Penelitian Kualitatif.* Bandung: Alfabeta.

Syarifudin. (2017). *Hidrologi Terapan*. Yogyakarta: Andi.

Wardani, S. (2015). Pemanfaatan teknologi augmented reality (AR). *Jurnal Teknologi*. 8(2), 104–111.