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Visual, Auditory, Reading, Writing, and Kinesthetic learning models assisted by Augmented Reality for problem solving of elementary school students

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Abstract. The purpose of this study was to test the effectiveness of the Visual, Auditory, Reading Writing, and Kinesthetic (VARK) learning model assisted by augmented reality (AR) on problem-solving. Learning models that can facilitate students' diverse learning styles are very much needed and are combined with augmented reality as part of the development of technology that is interesting for students so that student problem solving. Problem solving increases as one of the high-level thinking skills that are very important for students to have. The formulation of the problem in this study is whether the VARK learning model assisted by AR is effective on the problem-solving of elementary school students? This study uses quantitative research with a quasi-experimental design consisting of a control group and an experimental group. The data collection technique used is a problem-solving test. The study was conducted at an elementary school in Central Java Province. Data analysis used in the form of normality tests, homogeneity tests, independent t-tests, and paired t-tests. The results of the study indicate that the VARK learning model assisted by AR is effective, as shown by the results of the independent t-test, which obtained a significance value of 0.00 less than 0.05 and the results of the paired sample T-Test stated a sig value = 0.000 <0.05, meaning that students who take part in learning with the VARK model assisted by AR are better than students who receive conventional learning and problem-solving can increase

Keywords: VARK learning model (Visual, Auditory, Reading writing, and Kinesthetic); Augmented Reality (AR); Problem Solving; Elementary School

INTRODUCTION

Problem solving is a high-level thinking ability that has a very important role. Problem solving is not only a valuable competence, but also an approach to achieving other goals besides also having the potential to obtain important reasoning and improve understanding [1]. This ability is so important that in the world of education, learning objectives are directed to achieve problem-solving skills for all lessons that have been applied in the curriculum through designed basic competencies. However, it is still found among students, problem-solving skills are still low. It can be seen when students face a problem in the form of a problem, they give up first. Don't want to try and make an effort. For example, some are willing to try to solve it, but the solution obtained is not right. This phenomenon is a challenge on how to improve and increasing students' problem-solving skills. Therefore, learning is needed that facilitate it. In the classroom, of course, one student with another student has different characteristics including their learning style [2]. So in the current independent curriculum, there is differentiated learning which adapts to the characteristics of students related to learning styles, cognitive styles and others. Therefore, a learning model is needed that can facilitate students' learning styles because if there is a match between students' learning styles and how to educate and teach, it will help motivate the students' learning process.[3].

VARK contains learning styles in the form of visual, auditory, reading writing, and kinesthetic. Learning style is a tendency possessed by each student to adapt to certain learning strategies in learning as a form of responsibility to obtain a learning approach that is in accordance with learning demands. Each individual has their own learning style, this is what forms the character of the individual related to the methods that can be carried out in their respective learning processes. The VARK model is a new alternative model that is modified by utilizing student modalities [2]. This means that learning is carried out by considering the learning styles possessed by each student. VARK learning consists of 4 main categories, namely visual learning, which is learning in which there are ideas or concepts and information that can be presented in the form of images or techniques. Students who have a visual learning pattern are able to receive information if it is presented in the form of images, Auditory learning, which is learning using hearing, auditory learning is very dependent on hearing or speech heard by students during the learning process. Auditory learning requires listening to speech in order to understand better, but on the other hand students will have more difficulty understanding if they receive written instructions, and read/write learning is learning in which someone tends to read or write anything they hear or get from the surrounding environment and kinesthetic learning, which is learning where students do student activities in order to understand the material being taught. Students with kinesthetic learning abilities usually learn by practicing.

VARK is not only an inventory to find out the characteristics of learners, but it can also help students and teachers in choosing learning strategies and evaluation processes that are by student characteristics. With knowledge of student learning styles, it will be a reference for teachers to provide services to students according to their learning styles, so that by implementing learning by taking into account student learning styles or characteristics, it can improve students' ability to receive the material taught by the teacher [2]. The VARK model allows educators to identify how students prefer to learn and process information, and this can assist in designing learning experiences that are tailored to students' learning needs.[4][5].

The VARK model is a teaching model that uses a multi-sensory learning style that involves four elements of learning styles, namely vision, hearing, reading, and movement. This multi-sensory learning style suggests that teachers should not only encourage students to use one modality, but also try to combine all of these modalities to provide greater abilities and cover the shortcomings of each. This model is one of the strategies that is suitable for application in mathematics learning, because it can arouse imagination and strong motivation in learning mathematics. The magnitude of the students' positive arousal and motivation results in increased activities in learning mathematics and achievement. [6].

One of the technological developments that is currently trending is augmented reality (AR). AR that currently exists is also developing along with the development of today's technology, allowing the combination of the digital world and the real world [7]. AR is a technology that combines computer-generated digital content directly with the real environment. This technology is very suitable for use in learning because it is able to present a real representation of a phenomenon, so that the learning process which is usually monotonous can become more interesting and interactive.[8]. AR can also display multimedia content via laptops, smartphones, PCs, or other devices. AR is widely used in education, health, retail, industry, entertainment, games, and advertising. In the field of education, AR, if applied correctly, is considered to have advantages as a learning medium [9].

AR technology is one of the breakthroughs used lately in the field of learning. The use of this technology will be very helpful in conveying information to users. [10]. AR technology is one of the digital technologies that has the potential to be developed and applied in education. The ability of AR to display detailed visualizations and is supported by 3D animation, makes AR technology suitable for use in developing learning media. AR can be used by teachers to explain material in more detail and visually to improve students' understanding of the material presented [11].

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AR is very suitable for use because it is by the current era, namely, using Android. [14]. Learning media becomes more interesting and more concise, although it does not reduce the essence of the material if using AR.[15]. Teachers must make innovations in learning, namely changing conventional learning methods to digital, one of which is by updating the teaching materials used to become AR based teaching materials)[16]. In line with the development of science and technology, especially in the field of education, the use of learning media is becoming increasingly diverse and interactive, as is currently popular, namely by utilizing AR technology [17]. One of the competencies that

teachers must have is utilizing information and communication technology to communicate and develop themselves, so teachers are required to be able to develop creative and innovative teaching materials and apply them to learning in schools, one of which is with AR [13].

Based on interviews with teachers of SDN Bintoro 01 Demak and SDN 5 Tlogomulyo Semarang, it was found that the problem-solving of students are still low. The learning that has been carried out so far has not considered students' learning styles. As a result, learning is not interesting, and student learning outcomes are not optimal. Student learning achievement is also still relatively low. There are still many students who have not met the KKM. Students still have difficulty understanding the mathematical material. Abstract mathematics requires concrete learning media to make it easier to convey to students. From the identification of problems obtained where the learning that has taken place has not facilitated the learning styles of each student and the learning media used are still conventional, so that learning is not interesting for students and finally the learning outcomes in the form of students' problem-solving abilities are still low, so there needs to be a solution to solve this problem. Alternative learning is needed that pays attention to and facilitates students' learning styles and learning media that can improve students' problem-solving abilities. The VARK model and AR are assumed to be the solution to overcome this. Thus, a study will be carried out with the title VARK learning model assisted by AR on the problem-solving of Elementary School students.

The formulation of the problem in this study is whether the VARK learning model assisted by AR is effective for students' problem-solving. The purpose of this study is to test the effectiveness of the VARK learning model assisted by AR on elementary school students' problem-solving. This study has a state-of-the-art and novelty related to the VARK model and AR. Many previous studies have examined VAK alone, the R element is additional and new. There has been previous research on VARK, but for critical thinking ability variables, such as research by Karimah [3]. In addition, research related to VARK in the form of learning media [4], and in the form of an approach [7]. The difference with previous studies where in this study the treatment given is a VARK learning model with the help of AR with the steps, namely the teacher conveys learning objectives, the teacher conveys apperception, the teacher gives a diagnostic test as a detection of visual, auditory, reading writing, or kinesthetic learning styles. The teacher divides the class into several groups based on learning styles, the teacher prepares AR based on the VARK learning style, groups of students study the material according to the teacher's instructions based on the Visual, Auditory, Read write and Kinesthetic groups, the teacher provides worksheets in groups based on visual, auditory, reading writing, or kinesthetic learning styles, students present the results of their work in front of the class, then the teacher confirms and appreciates, and students together with the teacher draw up learning conclusions.

METHOD

The type of research used is Quasi-experimental [2] to test the influence and differences between the two groups, namely the experimental and control groups. Two sample classes are needed for the research design. The experimental class will receive treatment, while the control class will not receive treatment. The design used is a pretest-posttest only control design where the pretest is given to the experimental group while the posttest is given after treatment. The experimental group is given treatment in the form of a VARK learning model assisted by AR, while the control group uses conventional learning [3]. The population in this study were fifth grade students of SDN Bintoro 01 in Demak and SDN Tlogomulyo Semarang. The sample was divided into two groups, namely the experimental group with VARK learning model assisted by AR and the control group with conventional learning and with the sampling technique being cluster random sampling. This study used a data collection technique in the form of a problem-solving test. Before the test instrument was used, the study would conduct a trial of the instrument to determine its validity, reliability, discrimination power and level of difficulty. The type of test used was descriptive questions. The data analysis techniques used were normality test, homogeneity test, independent t-test, and paired t-test.

RESULTS

The results of the normality test to test whether the data is normally distributed or not using SPSS can be seen in the Shapiro Wilk column with the results of sig > 0.05 in the class with VARK learning model assisted by AR sig = 0.085 and data in the control class 0.231 which shows the data is normally distributed. The data in the class with VARK learning model assisted by AR and the control class are both normally distributed. This is in accordance with the criteria if the sig value <5% then H_0 is rejected [8]. The explanation is in table 1 below.

Tabel 1. Normality test

Class		Shapiro-Wilk		
		Statistic	Df	Sig.
Problem Solving	Experiment	.930	25	.085
	Control	.948	25	.231

The results of the homogeneity test which aims to test whether the data in both groups, both the control and experimental classes, have the same level of variation or not, obtained results as in table 2 below.

Tabel 2. Homogeneity test

Levene Statistic	Df1	Df1	Sig.
8.414	1	48	.006

From table 2 above, it shows the results of the homogeneity test analysis with the Levene test, a significance value of 0.006 was obtained, which is greater than 0.05, meaning that the variance in the experimental class and control class is the same or homogeneous. The results of the independent t-test to test the differences between the two groups, namely the differences between the group with the AR-assisted VARK learning model and the conventional learning model, obtained the results as in Table 3 below..

Tabel 3. *Independent Sample T-Test*

Result	t	df	Sid. (2-tailed)	Mean Difference	Std Error Difference
Equal variences assumed	13.220	48	.000	35.600	2.692
Equal variences not assumed	13.220	37.62	.000	35.600	2.692

Based on Table 3 presented, the significance value (sig 2-tailed) obtained through the t-test is 0.000. Because this probability value is less than 0.05, the null hypothesis (Ho) is rejected. This shows that there is a significant difference in problem-solving between students in the experimental class and the control class. Thus, we can conclude that students who follow learning with the VARK model assisted by AR show better performance compared to students who receive conventional learning. The results of the paired simple t-test, which were intended to determine the differences in problem solving in the class using the AR-assisted VARK model before and after treatment, obtained the results as per Table 4 below.

Tabel 4. Paired Sample T-test

	Posttest	Mean	Std Deviation	Std Error Mean	t	df	Sig. (2-tailed)
Pair 1	Experiment	-35.600	14.166	2.833	-12.565	24	.000

Based on table 4 above, the sig. value (2-tailed) 0.000 < 0.05 means there is a difference between the average value before and after learning using the AR-assisted VARK learning model. This shows that there is an influence of the AR-assisted VARK learning model on student problem solving.

DISCUSSION

Based on the research results obtained, it can answer the research objectives related to the effectiveness of using the VARK learning model assisted by AR on the problem-solving of fifth-grade students. The learning process is carried out according to the stages of the VARK model, which is designed to support students' learning styles. The results of the study showed that students who took part in learning with the VARK model assisted by AR had good problem-solving, meaning that the VARK model assisted by AR was effective on students' problem-solving, as shown by the results of the independent t-test and paired sample t-test in the experimental class using the VARK learning model assisted by AR. In addition, it is also reinforced by significant differences in the indicators of students' problem-solving, as shown in the following graph.

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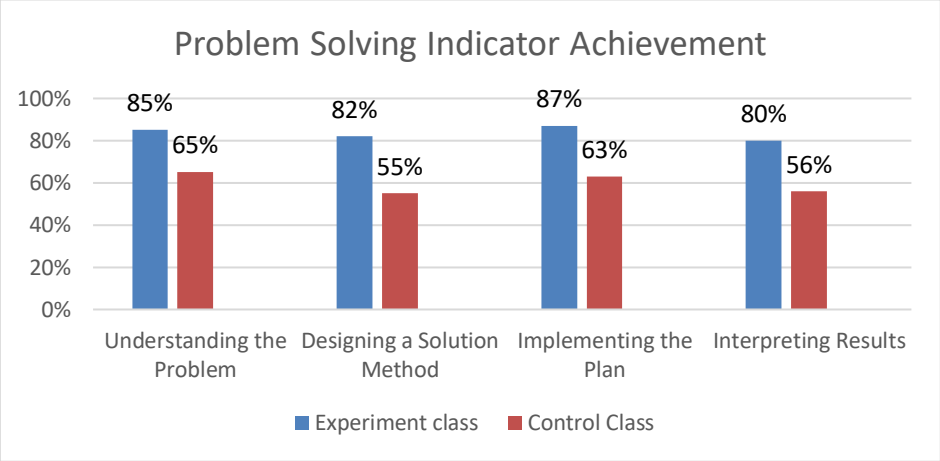

Figure 1. Achievement of students' problem solving indicators

It can be seen that the posttest results of students in the class with VARK learning model assisted by AR showed that their problem-solving increased significantly. This is reflected in the much higher average posttest score. This increase reflects the influence of the VARK learning model assisted by AR that supports various student learning styles. Where does the student's learning style fit in this learning model? It can be seen in the visual learning style with video-based learning, in the auditory learning style it is facilitated with sound in the form of recordings or audio media, while in the read-write learning style where students prefer reading or writing are facilitated with narrative or story media and students with a kinesthetic learning style are facilitated with projects. In learning using the VARK model assisted by AR, student involvement in the teaching and learning process is increasing. Students who were initially not very confident in solving problem-solving questions become more motivated and enthusiastic to participate. This learning model provides a more enjoyable learning experience, allowing students not only to understand the material but also to apply mathematical concepts in the context of problem solving. Therefore, the use of the VARK learning model assisted by AR can be an alternative because it has an effect on improving students' problem-solving.

Figure 2. VARK learning model assisted by AR

Learning with the VARK model assisted by AR has learning steps, such as in the initial activities in the form of preparation by determining objectives, preparing materials and media according to learning styles. In this activity, groups are divided based on student learning styles where in the visual learning style, using images and videos, in the auditory learning style, explaining with discussions and voice recordings, in the read/write learning style, providing reading notes, and in the kinesthetic learning style using props or games. In the final learning activity, an evaluation activity is carried out where the teacher gives interactive quizzes and feedback reflections. Students are introduced to learning content through interesting interactive media such as quizzes, games, and exercises created with learning applications. This learning model provides a more enjoyable learning experience and helps students understand the material according to their respective learning preferences. For example, displaying images and diagrams will greatly help students with a visual learning style, while auditory students can better understand concepts through the audio explanations provided. As a result, students are more enthusiastic and participate more actively in the learning process. They not only focus on participating in activities, but they also show courage in asking questions and discussing with their friends. The classroom atmosphere becomes more dynamic and interactive. Even students who are usually less confident or reluctant become motivated when completing the tasks given. This approach not only

increases student engagement in the teaching-learning process but also helps them understand mathematical concepts more deeply and enjoyably.

This is consistent with previous research, which shows that learning style-based learning (VARK) assisted by AR can significantly improve students' conceptual understanding [4]. This study concluded that adjusting learning to students' learning preferences increases their active class participation and makes it easier for them to absorb content. This finding, which shows that the use of interactive media in technology-based application learning is proven to produce a more interesting and effective learning experience. Interactive media can be used to help students understand abstract concepts, such as mathematics, more easily and in a way that suits their learning style, to then be used in solving mathematical problems. Therefore, the application of the VARK learning model in this study is not only relevant but also provides results that are in line with positive trends in the world of education and differentiated learning. In learning with conventional methods, students tend to be passive because learning is dominated by lecture methods without varied activities. The test results show a significance value (sig. 2-tailed) of 0.000, less than 0.05. This shows a significant difference between students' mathematical problem-solving in the experimental class using the VARK model assisted by AR compared to the control class using conventional methods.

The test results for the class with VARK learning model assisted by AR showed a significance value (sig. 2-tailed) of 0.000. This indicates that there is a significant increase in students' problem-solving before and after being given treatment using the VARK learning model assisted by AR. This increase in mathematical problem-solving abilities is in line with the theory of constructivism, which emphasizes that learning that involves real experiences and active student interaction can improve understanding and critical thinking skills. In learning with conventional methods, students tend to be passive because learning is dominated by lecture methods without varied activities. The average pretest and posttest scores show that students in the control class experienced lower improvements than students in the class with VARK learning model assisted by AR.

Based on the graph above, it can be seen that the increase in learning outcomes in the experimental class is much more significant than in the control class. This shows that the use of the VARK learning model assisted by AR can significantly improve student learning outcomes compared to conventional methods. The learning atmosphere in the experimental class is more active and interactive. The students seemed enthusiastic about the idea of combining the VARK learning model assisted by AR, and they are actively involved in the learning process. The diversity of student activities, including discussions, active movements, and the use of visual media and technology, shows that this method can attract students' attention while increasing their participation in learning. This dynamic teaching atmosphere reflects the success of the approach used in experimental teaching in creating a more comfortable and effective learning environment. In contrast to the experimental class, the atmosphere in the control class seemed more monotonous. Student activities are usually limited to traditional learning methods that do not include different learning styles. Compared to the experimental class, students seemed more passive and less actively involved. This shows that traditional learning methods have limited ability to attract students' attention, making it difficult to create an interactive and enjoyable learning environment. Therefore, this difference further supports that the experiential teaching method provides students with a more interesting learning experience.

This is in line with research, which states that the application of the VARK learning model assisted by AR can significantly improve student learning outcomes [7]. In addition, this research is also in line with research that emphasizes the importance of interactive media to support learning models based on students' learning styles [6]. So it can be concluded that the results of this study indicate that the VARK learning model assisted by AR is effective for students' problem solving abilities. This learning model allows students to learn according to their learning style, improves understanding, and motivates students to be more active in the learning process. Thus, this learning model is recommended as an innovative alternative in learning mathematics in elementary schools.

CONCLUSION

The VARK learning model assisted by AR applied is a learning that contains various student learning styles consisting of visual, auditory, read write and kinesthetic which are combined with the use of AR which is packaged very attractively so that learning in the classroom is more enjoyable. The VARK learning model assisted by AR has proven to be effective in student problem solving. This is based on the results of the independent t-test which shows a difference in problem solving between the experimental class and the control class. Therefore, the AVARK learning model assisted by AR is recommended to be applied in elementary school learning, of course, thorough preparation is needed because this learning model accommodates various learning styles and this is a challenge for teachers. In addition, problem solving can be improved with the VARK learning model assisted by AR.

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REFERENCES

[1] J. Jäder, J. Lithner, and J. Sidenvall, "Mathematical problem solving in textbooks from twelve countries," *Int. J. Math. Educ. Sci. Technol.*, vol. 51, no. 7, pp. 1120–1136, 2020, doi: 10.1080/0020739X.2019.1656826.

[2] Nurhidayah, "Implementasi Gaya Belajar Vark Dengan Media Pembelajaran Berbasis Online terhadap Pemahaman Konsep dan Pemecahan Masalah Matematika Siswa," *J. Peqguruang Conf. Ser.*, vol. 3, no. November, pp. 484–489, 2021.

[3] S. A. Kariimah, H. Susilo, U. S. Hastuti, B. Balqis, and W. O. Nurhawa, "The effect of problem-based learning using VARK approach on biology students' creative thinking skills," *BIO-INOVED J. Biol. Pendidik.*, vol. 4, no. 2, p. 187, 2022, doi: 10.20527/bino.v4i2.13138.

[4] N. J. Rizki *et al.*, "Implementasi Model Vark Dalam Penguasaan Kelas Untuk Meningkatkan Prestasi Siswa dan masyarakat . Di era ini yang dipenuhi dengan informasi dan teknologi , pendidikan 1 . Definisi Media VARK mengakomodasi preferensi belajar siswa sesuai dengan model VARK ," no. 1, 2024.

[5] N. Supriadi, D. Vitona, and A. Rinaldi, "the Vark-Fleming Model and Self-Concept: Does It Affect Mathematical Concepts Understanding," *AKSIOMA J. Progr. Stud. Pendidik. Mat.*, vol. 12, no. 2, p. 2009, 2023, doi: 10.24127/ajpm.v12i2.7532.

[6] A. Agusriandi, "Peningkatan Matematika Melalui Model VARK-Fleming Pada Kelas VIII SMP Negeri 3 Mattiro Sompe," *Difer. J. Pendidik.*, vol. 4047, no. 2, p. 41, 2020.

[7] A. M. Arifin, H. Pujiastuti, and R. Sudiana, "Pengembangan media pembelajaran STEM dengan augmented reality untuk meningkatkan kemampuan spasial matematis siswa," *J. Ris. Pendidik. Mat.*, vol. 7, no. 1, pp. 59–73, 2020, doi: 10.21831/jrpm.v7i1.32135.

[8] B. Setiawan, R. Rachmadtullah, E. Sugandi, and D. A. M. Farid, "Pelatihan Pembuatan Media Pembelajaran Berbasis Augmented Reality Pada Kelompok Kerja Guru Sekolah Dasar Desa Kemasantani Mojokerto," *Etos J. Pengabdi. Masy.*, vol. 4, no. 1, pp. 72–79, 2022.

[9] R. H. Mikkael, E. R. Yanti, H. Aulawi, P. N. Anggraeny, and D. Kurniawan, "Pelatihan Pembelajaran Sejarah Islam Menggunakan Augmented Reality," *J. Karya untuk Masy.*, vol. 3, no. 1, pp. 1–9, 2022.

[10] A. Widiyatmoko *et al.*, "Pelatihan Pemanfaatan Science Augmented Reality Model Problem Based Learning Pada MGMP Guru IPA Kota Semarang," *J. Community Empower.*, vol. 1, no. 2, pp. 12–18, 2021, doi: 10.15294/jce.v1i2.53415.

[11] W. N. Hidayat, T. A. Sutikno, Patmanthara, C. D. I. Kartikasari, and A. F. Firdaus, "Peningkatan keterampilan Pembuatan Media Pembelajaran berbasis Augmented Reality untuk Guru SMK," *J. Graha Pengabdi.*, vol. 1, no. 2, pp. 93–103, 2019.

[12] D. A. Afthori, D. Kurniadi, and A. R. Atmadja, "Perancangan Media Interaktif Rumus Bangun Ruang Menggunakan Teknologi Augmented Reality Berbasis Android," *Integr. (Information Tecknology Vocat. Educ.*, vol. 1, no. 2, pp. 9–13, 2019.

[13] A. K. Sari, P. R. Ningsih, W. Ramansyah, A. Kurniawati, I. A. Siradjuddin, and M. K. Sophan, "Pengembangan Kompetensi Guru Smkn 1 Labang Bangkalan Melalui Pembuatan Media Pembelajaran Augmented Reality Dengan Metaverse," *Panrita Abdi - J. Pengabdi. pada Masy.*, vol. 4, no. 1, p. 52, 2020, doi: 10.20956/pa.v4i1.7620.

[14] Fatimatuzzahro, M. S. Masyhud, and R. Alfarisi, "Pengembangan Media Pembelajaran Komik Matematika Asik (MASIK) Berbasis Augmented pada Materi Volume Bangun Ruang," *J. Ilmu Pendidik. Sekol. Dasar*, vol. 8, no. 1, pp. 7–29, 2021, [Online]. Available: https://jurnal.unej.ac.id/index.php/JIPSD/article/view/24755

[15] I. Mustaqim and N. Kurniawan, "Pengembangan Media Pembelajaran Pai Berbasis Augmented Reality," *Lentera Pendidik. J. Ilmu Tarb. dan Kegur.*, vol. 21, no. 1, pp. 59–72, 2018, doi: 10.24252/lp.2018v21n1i6.

[16] R. A. Hanan, I. Fajar, and S. A. Pramuditya, "Desain Bahan Ajar Berbasis Augmented Reality pada Materi Bangun Ruang Bidang Datar," *Pros. SNMPM II*, vol. 2, no. 1, pp. 287–299, 2018.

[17] A. Suharso, "Model pembelajaran interaktif bangun ruang 3D berbasis augmented reality," *Solusi*, vol. 11, no. 24, pp. 1–11, 2012.