Artificial Intelligence Based Interactive Learning Media to Improve Science and Social Learning Outcomes of Fourth Grade Elementary School

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A B S T R A K

Keterbatasan media pembelajaran yang digunakan dalam pembelajaran IPAS menjadikan peserta didik kurang termotivasi untuk belajar dan kurang optimalnya pemahaman terhadap materi pembelajaran. Kendala tersebut berdampak pada rendahnya hasil belajar peserta didik. Penelitian ini bertujuan untuk menciptakan media pembelajaran interaktif berbasis artificial intelligence untuk meningkatkan hasil belajar kelas IV Sekolah Dasar. Jenis penelitian ini adalah penelitian pengembangan (Research and Development). Model pengembangan yang digunakan adalah model pengembangan Borg & Gall. Subjek yang terlibat dalam penelitian ini terdiri dari tim ahli, guru kelas, dan peserta didik kelas IV. Teknik pengumpulan data diperoleh melalui observasi, wawancara, kuesioner, dokumentasi, dan tes. Teknik untuk menganalisis data menggunakan teknik analisis data awal berupa uji normalitas dan teknik analisis akhir berupa uji t dan uji N-Gain. Hasil penelitian menunjukkan bahwa media yang dikembangkan dinyatakan layak dan efektif. Dinyatakan layak berdasarkan validasi dari ahli materi memperoleh skor 92,3% dan validasi ahli media memperoleh skor 96,4%, keduanya dalam kategori sangat layak. Dinyatakan efektif berdasarkan hasil pretest dan posttest peserta didik dengan melakukan uji N-Gain memperoleh skor 0,56 yang menunjukkan bahwa terjadi peningkatan hasil belajar peserta didik dalam kategori sedang. Simpulan penelitian ini adalah media pembelajaran interaktif berbasis artificial intellegence yang dikembangkan layak dan efektif digunakan sebagai media pembelajaran untuk meningkatkan hasil belajar peserta didik kelas IV Sekolah Dasar.

A B S T R A C T

The limited learning media used in IPAS learning makes students less motivated to learn and less optimal understanding of learning materials. These obstacles have an impact on the low learning outcomes of students. This research aims to create an interactive learning media based on artificial intelligence to improve the learning outcomes of grade IV elementary school. This type of research is development research (Research and Development). The development model used is the Borg & Gall development model. The subjects involved in this study consisted of a team of experts, classroom teachers, and grade IV students. Data collection techniques were obtained through observation, interviews, questionnaires, documentation, and tests. Techniques for analyzing data used initial data analysis techniques in the form of normality tests and final analysis techniques in the form of t tests and N-Gain tests. The results showed that the developed media was declared feasible and effective. Declared feasible based on validation from material experts obtained a score of 92.3% and media expert validation obtained a score of 96.4%, both in the very feasible category. It was declared effective based on the results of the pretest and post-test of students by conducting the N-Gain test obtained a score of 0.56 which showed that there was an increase in student learning outcomes in the moderate category. The conclusion of this study is that the artificial intelligence-based interactive learning media developed is feasible and effective use as a learning media to improve the learning outcomes of grade IV elementary school students.

1. INTRODUCTION

Interactive learning media is an indispensable tool in the teaching and learning process of Natural and Social Sciences (IPAS) for elementary school students. This is because through interactive learning

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media, learning materials will be presented with attractive visualizations and involve active interaction from students (Fitra & Maksum, 2021; Suhada et al., 2021). This interesting visualization can help students understand abstract concepts in Natural Science subjects better (Sastra et al., 2023; Widaraeni & Vivianti, 2021). In addition, the interactivity feature encourages the involvement of various senses owned by students (Agustira & Rahmi, 2022; Suryanti et al., 2021). The more senses that are involved in this process, such as collecting and organizing information, the greater the likelihood that the information can be understood and embedded in learners' memories. Therefore, teachers and researchers agree that interactive learning media plays an important role in improving students' IPAS learning outcomes (Iasha et al., 2019; Yuliana Kasuma Dewi, 2023; Zaqiyah & Sari, 2024).

Researchers have noted that interactive learning media can increase students' learning motivation in teaching and learning (Daniati et al., 2023; Sulistiyowati et al., 2023; Tri Wulandari & Adam Mudinillah, 2022). In this case, in general, the use of interactive learning media can improve IPAS learning achievement because IPAS material is presented in an interesting and interactive way compared to non-interactive learning media (Donasari & Silaban, 2021; Musafa, 2018). Interactive learning media can be accessed anywhere and anytime with the help of digital technology so as to make the learning process more flexible, students can review the material if they feel unclear (Nofitasari et al., 2021; Pramita & Supriyo, 2024; Rochayati & Setyawati, 2024). Interactive learning media also makes the IPAS learning process more efficient so that students can achieve more optimal learning outcomes (Ririn et al., 2024; Vriyanti et al., 2023). Therefore, the existence of interactive learning media in the IPAS teaching and learning process is very important for elementary school students to improve IPAS learning outcomes.

Based on the results of observations and pre-research interviews conducted by researchers to the fourth grade teacher of SDN Winong 01, several problems were found during teaching and learning activities. One of them is the limitation of interactive learning media used in IPAS learning. Package books provided by the government and the blackboard are commonly used learning media, making students less interested and easily bored during learning. On the other hand, SDN Winong 01 has facilities that are quite supportive for the application of interactive learning media such as the availability of laptops, WiFi, and projectors but these facilities have not been optimally utilized in learning. In addition, based on the documentation of the learning results of the Mid-Semester Summative (STS) of the odd semester of IPAS class IV SDN Winong 01, it shows that learning outcomes are less than optimal. Characterized by the existence of some students who have not been able to reach the Learning Objective Achievement Criteria (KKTP) limit. It is known that the KKTP value set for IPAS subjects is 70. Of all students, 11 (42.31%) students have not reached KKTP and 15 (57.69%) students have reached KKTP. The results of this pre-research observation and interview reinforce the findings of previous researchers that in general the low learning outcomes of IPAS are caused by the lack of availability of learning media and the dominance of the lecture method by teachers (Astiti et al., 2021; Juhardi & Amirullah, 2022; Wahyuni & Sayekti, 2023).

Experts suggest that in addition to providing interactive learning media, it is also necessary to develop learning media that utilize the latest technology such as artificial intelligence (Dinata et al., 2024; Mambu et al., 2023; Maufidhoh & Maghfirah, 2023). In the education sector, artificial intelligence can help improve learning methods and provide more flexible access to educational resources (Maufidhoh & Maghfirah, 2023; Supriadi et al., 2022). Artificial intelligence technology has been utilized in various platforms such as Canva (Aulia et al., 2023). Through Canva, users can create visual content designs for learning purposes that are interactive, interesting, and in accordance with the characteristics of learners (Aulia et al., 2023; Hardianto et al., 2024). The use of artificial intelligence-based interactive learning media in the form of Canva in learning is also proven to improve student learning outcomes (Aluintany & Bektiningsih, 2024; Tyas & Aeni, 2024)The increase in learning outcomes can occur because artificial intelligence-based interactive learning media, (1) can attract the attention of students (Darniyanti et al., 2023; Rahmawati et al., 2024); (2) make learning materials more concrete (Almasri, 2024; Syaflin, 2022); (3) and increase the motivation of students to be more actively involved in the learning process (Pangalila et al., 2024; Triningsih, 2021).

Previous research related to the development or implementation of artificial intelligence-based interactive learning media in Elementary Schools has been conducted by several researchers. The results of previous studies show that the use of Canva-assisted artificial intelligence learning media can improve students' math learning outcomes, which before the media is applied in the sufficient category and after the media is applied in the high category (Halidin, 2023). The use of Canva-based interactive learning media can improve IPAS learning outcomes so that this has a postitive impact on the learning process (Aluintany & Bektiningsih, 2024). Another research is the implementation of artificial intelligence-based learning using puzzle maker media for elementary school students (Maufidhoh & Maghfirah, 2023). The implementation of learning using artificial intelligence for elementary school students in Batu City, Malang, East Java (Rahadiantino et al., 2022). A study on the utilization of artificial intelligence technology

in facing teaching challenges by teachers in the digital era (Maufidhoh & Maghfirah, 2023). Another study developed artificial intelligence-based Chatbot teaching materials on Class V Human Digestive System Material in elementary schools (Kasmayanti et al., 2023). Development of comic media through artificial intelligence of Pancasila education to improve student learning outcomes in class V Elementary Schools (Tyas & Aeni, 2024). Development of artificial intelligence-based digital comic learning media in Elementary Schools (Aziz et al., 2024). In this case, previous research still focuses on the development or implementation of artificial intelligence-based learning media in Elementary Schools, but no one has specifically developed artificial intelligence-based interactive learning media in IPAS subjects My Material and My Needs grade IV Elementary School.

Based on a review of the opinions of experts, it can be concluded that the urgency of research on the development of interactive learning media based on artificial intelligence in the subject of IPAS material Me and My Needs in class IV Elementary School. at the elementary school level, interactive learning media has a major effect in shaping the concept of initial knowledge considering that at this level elementary school students are still in the concrete operational stage (Sahronih et al., 2020). The use of artificial intelligence-based interactive learning media, apart from being a tool for delivering interesting learning material, also brings new innovations that can support the overall education process (Aziz et al., 2024; Tyas & Aeni, 2024). Learning by using interactive learning media is also proven to have a positive impact on the IPAS learning outcomes of elementary school students (Qolbu et al., 2022; Sajidah & Wulandari, 2024). Therefore, it can be said that there is an urgency to develop artificial intelligence-based interactive learning media for IPAS subjects in grade IV SD. This is mainly due to three factors, namely, (1) the availability of interactive learning media based on artificial intelligence for IPAS subjects on the material of Me and My Needs in grade IV elementary school; (2) students need to understand the material of Me and My Needs in a simpler and more interesting way; (3) students need to optimize IPAS learning outcomes on the material of Me and My Needs.

This study aims to develop an interactive learning media based on artificial intelligence material Me and My Needs to improve the learning outcomes of IPAS class IV elementary school students who are feasible and effective. In more detail, the objectives of this study are, (1) to develop artificial intelligence-based interactive learning media; (2) to test the feasibility of artificial intelligence-based interactive learning media developed based on expert assessments and users; (3) to test the effectiveness of artificial intelligence-based interactive learning media based on the improvement of IPAS learning outcomes in the material of Me and My Needs. The novelty in this research can be seen from the absence of research that specifically reviews the development of artificial intelligence-based interactive learning media for IPAS subject matter of Me and My Needs for grade IV elementary school.

2. METHOD

The type of research used in this study is development research (Research and Development). Development research is research used to produce certain products and test the effectiveness of these products (Sugiyono., 2014). The development model used is the Borg & Gall development model which consists of several stages, namely: (1) the potential and problem stage, at this stage identification is carried out in the form of potential and problems that exist at SDN Winong 01; (2) the data collection stage, the data collection stage is carried out by interviewing the class teacher and giving questionnaires to teachers and students; (3) the product design stage, at this stage the researcher designs the product in the form of interactive learning media based on artificial intelligence in the IPAS subject matter of Me and My Needs; (4) Design validation stage, the design validation stage is carried out by experts in their fields; (5) Design revision stage, at this stage after the interactive learning media is validated, improvements are made according to the suggestions given by material experts and media experts; (6) Product trial stage, the design of interactive learning media products that have been made; (7) Product revision stage, products that have been simulated have proven to be more effective in use, no revisions need to be made so that they need to be applied to a wider sample; (8) Usage trial stage, products that have been tested and proven effective in use, then implemented on a large scale.

The subjects in this study consisted of material experts, media experts, teachers, and 26 fourth grade students of SDN Winong 01. The data collection techniques used in this study was test techniques and non-test techniques. The test technique was used to measure the effectiveness of interactive learning media before and after the application of the product through giving pretest and posttest to students. While non-test techniques are used to measure the validity of interactive learning media through the administration of questionnaires. The instruments used in data collection include pretests and posttests, expert validation instruments, teacher response questionnaires, and student response questionnaires. Expert validation instruments are addressed to material validators and media validators. The grids of the

material expert and media expert validation instruments are presented in Table 1 and Table 2. The grids of the teacher and learner response questionnaires are presented in Table 3 and Table 4.

Table 1. Material Expert Instrument Grid

Aspect	Indicator	Number of Items
Content	Suitability of learning materials	4
Language	Appropriateness of language use	3
Presentation	Appropriateness of media presentation	6
Amount		**13**

Table 2. Media Expert Instrument Grid

Aspect	Indicator	Number of Items
Content	Suitability of media with material	4
Interactivity	Learning media attractiveness	3
Navigation	Navigation advantages	3
Display and Media	Appropriateness of media display presentation	9
Language	Appropriateness of language use	2
Interactive Learning Media	Ease of media usage	2
Amount		**23**

Table 3. Teacher Response Questionnaire Grid

Aspect	Indicator	Number of Items
Content	Suitability of learning materials	3
Language	Language appropriateness	2
Media	Media attractiveness	5
Amount		**10**

Table 4. Learner Response Questionnaire Grid

Aspect	Indicator	Number of Items
Content	Suitability of learning materials	3
Media	Media attractiveness	4
Benefit	Media advantages	2
Amount		**10**

Data analysis carried out in the study included data analysis of expert validity tests, data analysis of user responses, and data analysis of the calculation of students' pretest and posttest learning outcomes scores. Expert validity test data obtained from the assessment of material experts and media experts. User response test data is obtained from the results of questionnaires given to teachers and students. Expert validity test data and user response test data are intended to determine the feasibility of the interactive learning media developed. This test was carried out by scoring the validation questionnaire sheet using a Likert Scale. The scoring guide is presented in Table 5.

Table 5. Likert Scale Measurement

Score	Criteria
4	Very Good
3	Good
2	Enough
1	Not Enough

The data obtained from the validation score is then analyzed by calculating the percentage amount. The results of the percentage amount are then used to determine the suitability of the media based on the media eligibility criteria presented in Table 6

Table 6. Product Eligibility Criteria

Percentage	Criteria
86%-100%	Very Feasible
76%-85%	Worthy
60%-75%	Decent Enough

Percentage	Criteria
55%-59%	Less Feasible
<54%	Not Feasible

Data analysis techniques used to process data on pretest and posttest learning outcomes of students include initial data analysis and final data analysis. Initial data analysis in the form of normality test and final data analysis in the form of t test and N-Gain test. The t test was conducted to determine the increase in student learning outcomes, while the N-Gain test was conducted to determine the average increase in student learning outcomes. The analysis of students' learning outcomes was carried out by comparing the prestest and posttest scores using the N-Gain formula. N-Gain interpretation criteria are presented in Table 7.

Table 7. N-Gain Index Criteria

Interval N-Gain	Criteria
N-gain ≤ 0.3	Low
0.3 < N-gain < 0.7	Medium
N-gain ≥ 0.7	High

3. RESULT AND DISCUSSION
Result

The results of this study are about the design of interactive learning media based on artificial intelligence, feasibility, and effectiveness of learning media. The media development process in this study uses the Borg & Gall model which is carried out up to the eighth stage. The first stage is potential and problems. At this stage, identification is carried out in the form of potential and problems that exist in class IV SDN Winong 01 by conducting observations and documentation of student learning outcomes. From this identification, the potential and problems obtained are the limitations of learning media used in IPAS subjects so that learning media is not enough to attract learning motivation and make students less understand the material being taught. This is supported by the less than optimal learning outcomes of students. On the other hand, SDN Winong 01 has available facilities and infrastructure to support the use of more innovative learning media such as the availability of laptops, LCD, and Wifi. The second stage is data collection. Data collection was carried out by interviewing the fourth grade teacher and providing a product development needs questionnaire to teachers and students. Based on the results of interviews with teachers, information was obtained that learning media were needed to support IPAS subjects, in addition to teacher books and student books. According to the fourth grade teacher regarding the content of IPAS lessons, especially the material of Me and My Needs, there is no supporting learning media so it is necessary to develop media that is interesting and can motivate students in learning activities. In addition, the teacher said that students like to learn using technological assistance, students will be more enthusiastic and focused so that the material will be easily understood well. Therefore, researchers want to develop interactive learning media based on artificial intelligence.

The third stage is product design. At this stage the researcher designs learning media products based on the teacher and learner needs analysis questionnaire. Product development in the form of artificial intelligence-based interactive learning media using Canva assistance. Product design begins with compiling an initial framework then continues to compile a script to be applied to the media which consists of learning outcomes, learning objectives, material, games, summaries, and bibliography. Furthermore, adding the developer profile section, instructions for using the media, navigation buttons and animations that are in accordance with the material. The fourth stage is design validation. The design developed by researchers was then validated by material experts and media experts. Each expert provided an assessment of the artificial intelligence-based interactive learning media using a validation questionnaire instrument. In addition to assessing the media, both experts also provide input and suggestions for the media developed so that the media is suitable for use in learning. The results of the validation of material experts and media experts are presented in Table 8.

Table 8. Material and Media Expert Validation

Assessor	Maximum Score	Score Obtained	Percentage	Criteria
Materials Expert	52	48	92.3%	Very Feasible
Media Expert	84	81	96.4%	Very Feasible

Table 8 is the result of validation from material experts and media experts on the developed product. Based on the calculation of the assessment results from material experts, a percentage of 92.3%

was obtained in the very feasible category and the results of the media expert assessment obtained a percentage of 96.4% in the very feasible category. The eighth stage is design revision. Products that have been assessed by material experts and media experts are then revised according to input and suggestions from experts. The display of artificial intelligence-based interactive learning media is presented in Figure 1.

Cover View

Developer Profiles

Instructions for Use

Learning Menu

Lesson material

Game

Figure 1. Final Media Results

The sixth stage is product testing. Product trials were conducted by applying the developed learning media to teachers and learners on a small scale involving six fourth grade students of SDN Winong 01with different academic abilities. The selection of learners was based on purposive sampling technique. The purpose of the small-scale trial was to determine the feasibility of the product before the artificial intelligence-based interactive learning media was tested for use on a large scale. In the trial, teachers and students were given a questionnaire of responses to the learning media. The results of the teacher and learner response questionnaire for the product trial are presented in Table 9.

Table 9. Recapitulation of Teacher and Learner Response Questionnaires

Assessor	Score Obtained	Percentage	Criteria
Teacher Response	37	92.5%	Very Feasible
Learner response	39	97.5%	Very Feasible

The seventh stage is product revision. Based on Table 9, the results of the teacher response questionnaire in the trial in class IV SDN Winong 01 obtained very feasible criteria. The results of the student response questionnaire in the trial obtained very feasible criteria. Based on the results of the response questionnaire in the product trial, there is no need to make improvements to the learning media product so that researchers can proceed to the usage trial stage. The eighth stage is the usage trial. The usage trial was tested on a large scale involving 20 fourth grade students of SDN Winong 01 to determine the effectiveness of using interactive learning media based on artificial intelligence. In the large-scale trial of use, pretest and posttest were given to students to assess the learning outcomes of students before and after the use of artificial intelligence-based interactive learning media. If there is an increase in learning outcomes, it can be concluded that the developed media is effectively used in learning. The results of the pretest and posttest in the usage trial are presented in Table 10.

Table 10. Pretest and Posttest Results

Action	Average	Highest Score	Lowest Score	Number of Students Who Completed	Mastery Learning	Enhancement
Pretest	61.85	73	43	3	15%	75%
Posttest	83.05	97	67	18	90%	

Table 10 is the results of the pretest and posttest in the usage trial. The pretest results obtained the lowest score of 43 and the highest score of 73 with an average of 61.85. The number of students who completed as many as 3 out of 20 students who took the prestest. The posttest results obtained the lowest score of 67 and the highest score of 97 with an average of 83.05. The number of students who completed as many as 18 out of 20 students who took the posttest. Next, analyze the initial data. Initial data analysis was carried out with a normality test on pretest and posttest learning outcomes. The normality test was carried out to determine whether the pretest and posttest learning outcomes were normally or abnormally distributed. The normality test was calculated using SPSS 24 for Windows with the Shapiro-Wilk technique. Data is declared normally distributed if the significance value is > 0.05 and vice versa the data is declared not normally distributed if the significance value is < 0.05. The results of the Normality Test are presented in Table 11.

Table 11. Normality Test Results

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Pretest	0.147	20	0.200	0.934	20	0.183
Posttest	0.120	20	0.200	0.952	20	0.402

Based on Table 11, the pretest and posttest results show that the data is normally distributed. It is said to be normal because the significance value obtained in the Shapiro-Wilk table >0.05. Furthermore, the final data analysis was carried out by conducting a t-test and N-Gain test. The t-test aims to determine the increase in learning outcomes of students who have completed the pretest and posttest. If the significance value of the paired sample t-test is <0.05, the data is accepted or it can be said to have increased and vice versa if the significance value of the paired sample ttest is >0.05, the data is considered not accepted or it can be said that it has not increased. The t-test results are presented in Table 12.

Table 12. T-Test Results

	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig (2-tailed)
Usage Trial	-21.200	5.727	1.281	-23.880	-18.520	-16.554	19	0.000

Based on Table 12, the significance value of the paired sample t test is 0.000 which is smaller than the significance level of 0.05. So, it is concluded that there is an increase in students' posttest learning outcomes. The next data analysis using the N-Gain test aims to determine the average increase in learning outcomes achieved by students in the pretest and posttest using artificial intelligence-based interactive learning media. The results of the N-Gain test are presented in Table 13.

Table 13. N-Gain Test Results

	Average Pretest	Average Posttest	Average Difference	N-Gain	Criteria
Usage Trial	61.85	83.05	21.2	0.56	Medium

Based on Table 13, the learning outcomes of students obtained an average difference of 21.2 with an average increase of 0.56 including in moderate criteria. So, it is concluded that interactive learning media based on artificial intelligence is effectively used to improve the learning outcomes of IPAS material Me and My Needs.

Discussion

In this development research, the product produced is in the form of interactive learning media based on artificial intelligence in IPAS subject matter of Me and My Needs class IV SDN Winong 01 which is feasible and effective in improving student learning outcomes. The stages of development carried out include the potential and problem stages, data collection, product design, design validation, design revision, product trials, product revision, and trial use. The results of the needs analysis obtained the results that artificial intelligence-based interactive learning media is needed on the material of Me and My Needs. Artificial intelligence-based interactive learning media contains subject matter presented with an attractive appearance that can help make it easier for students to construct knowledge through interactive learning media (Maufidhoh & Maghfirah, 2023; Rahadiantino et al., 2022). The design of artificial intelligence-based interactive learning media is made using Canva. Canva as an online graphic design tool platform that utilizes artificial intelligence technology can help make learning media designs with more

creative and interactive presentations (Aulia et al., 2023; Savitri et al., 2024). The final result of the media contains various information such as learning outcomes and objectives, materials, games, summaries, and bibliographies that are integrated in the learning menu page. There are hyperlink features and various relevant animations that attract students' learning motivation. The implementation of teaching and learning activities using Canva-based interactive learning media can encourage students to be more active and motivated to learn even harder (Daniati et al., 2023; Pangalila et al., 2024; Sulistiyowati et al., 2023).

The development of artificial intelligence-based interactive learning media meets the feasibility aspects to be used as learning media to improve student learning outcomes. Proven by the results of the assessment of experts and media users obtained very feasible criteria. The results of other studies related to the development of artificial intelligence-based interactive learning media show similar things, namely artificial intelligence-based learning media developed obtained very feasible criteria based on expert assessment because it can provide solutions for teachers and students to understand the subject matter (Istiqomah et al., 2023; Kasmayanti et al., 2023). Artificial intelligence-based learning media is declared very feasible because the material presented is packaged interestingly and in accordance with the learning objectives (Istiqomah et al., 2023; Tyas & Aeni, 2024). Valid artificial intelligence-based learning media indicates that the media can be used in learning because it contains activities, subject matter, and evaluations that can be used to measure student learning outcomes (Aziz et al., 2024; Lubis & Silalahi, 2023).

The development of interactive learning media based on artificial intelligence is also proven to be effective in improving the learning outcomes of students on the material of Me and My Needs class IV Elementary School. It can be seen from the posttest scores of students who are higher than the pretest scores. The effectiveness of artificial intelligence-based interactive learning media is evidenced by an increase in the average learning outcomes of students with moderate criteria. Interactive learning media is effective in improving IPAS learning outcomes because it provides many variations of learning, making students not easily bored of the delivery of material by the teacher (Pentianasari et al., 2023; Yuliana Kasuma Dewi, 2023). The results showed that Class IV elementary school students could understand the material of Me and My Needs with a more varied learning experience after using artificial intelligence-based interactive learning media. The results of other studies state that learning using interactive learning media has a higher chance of improving student learning outcomes (Aluintany & Bektiningsih, 2024; Candra & Rahayu, 2021). This is because with interactive learning media, students can access learning media flexibly as independent teaching materials so that it has the potential to optimize understanding and improve the learning outcomes of elementary school students (Candra & Rahayu, 2021; Rahadiantino et al., 2022; Ramadhan et al., 2023).

The results of this study indicate that the use of artificial intelligence-based interactive learning media is superior to conventional learning media. Interactive learning media based on artificial intelligence makes IPAS learning more concrete supported by visualization of interesting material presentation (Pentianasari et al., 2023; Vriyanti et al., 2023). Interactive learning media facilitates students to actively participate in learning activities so as to create a more real learning situation in building knowledge (Octaviani & Desyandri, 2023; Yuliana Kasuma Dewi, 2023). Similar research also confirms that artificial intelligence-based interactive learning media can encourage students to have a high desire to learn learning materials (Daniati et al., 2023; Tri Wulandari & Adam Mudinillah, 2022). Thus, the findings in this development research can provide implications for subjects in elementary schools, especially IPAS subjects, namely increasing the availability of artificial intelligence-based interactive learning media that are feasible and effective to be able to improve student learning outcomes in IPAS class IV subjects, especially the material of Me and My Needs. This artificial intelligence-based interactive learning media can be an alternative for teachers or other researchers to apply and develop interactive learning media for My Material and My Needs that presents material with interesting and interactive visualizations so that students understand the material more easily and are more active in learning so that students' learning outcomes also become optimal.

Although the results of research on the development of artificial intelligence-based interactive learning media are declared feasible and effective for improving IPAS learning outcomes, this artificial intelligence-based interactive learning learning media has limitations in scope. The limitations of this research are only focused on the IPAS subject matter of Me and My Needs. Therefore, researchers suggest that further research can expand the development of artificial intelligence-based interactive learning media for other subjects. Thus it will create wider and flexible opportunities for the development of artificial intelligence-based interactive learning media to improve learning outcomes in various fields of science.

4. CONCLUSION

The artificial intelligence-based interactive learning media developed in this study is included in the category of feasible and effective to improve learning outcomes of IPAS material Me and My Needs grade IV Elementary School. The validity of artificial intelligence-based interactive learning media shows that learning media is valid and feasible to use in learning. The effectiveness of artificial intelligence-based interactive learning media is evidenced by the average difference in student learning outcomes in the material of Me and My Needs which shows a more positive direction. Thus, the artificial intelligence-based interactive learning media developed and applied to IPAS subjects on the material of Me and My Needs in class IV Elementary School provides a more interesting and meaningful learning experience about the material of Me and My Needs so that participants will more easily understand the material and have an impact on increasing learning outcomes.

5. ACKNOWLEDGE

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