Effectiveness of Visual Basic for Application based PowerPoint as an Interactive Learning Media to Increase Learning Interest in Astronomy

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Abstract: This study aims to investigate the effectiveness of VBA-based PowerPoint as an interactive learning medium to increase interest in learning astronomy. The research design used was a Pre-Experimental Design with a one-group pretest-posttest design. The subjects of this study were 20 second-semester students majoring in Astronomy at the University of Muhammadiyah Sumatera Utara. Research data were collected using a questionnaire designed with a Likert scale. The questionnaire consisted of 18 statements, comprising both positive and negative statements. The data analysis technique used was the Paired Sample T-Test. The results of the study indicated that interactive learning media, based on PowerPoint and utilizing VBA, can increase students' interest in learning basic astronomy. The results of the Paired Sample T-Test showed that the significance value (2-tailed) obtained was 0.000. This result indicates a significant difference in learning interest before and after using the interactive PowerPoint-based VBA learning media. This suggests that the use of interactive PowerPoint-based VBA learning media is effective in enhancing learning interest in basic astronomy education. This finding implies that teachers can adopt PowerPoint enhanced with VBA as a cost-effective and easily accessible tool to stimulate learning interest in complex subjects.

INTRODUCTION

Astronomy is one of the oldest sciences that studies the universe beyond Earth's atmosphere, including the sun, planets, moon, and stars (Lisboa et al., 2020). Astronomy is part of the education and cultural system, contributing to the development of physics and other sciences, and is present in the history of almost every civilization (Timur et al., 2020). This field plays a crucial role as it teaches various fundamental scientific skills, such as observation, classification, prediction, experimentation, and presentation (Ampartzaki et al., 2024). However, some studies indicate that astronomy is a complex discipline to teach and learn (Clemente et al., 2022). Some teachers also avoid teaching topics related to astronomy because they are considered abstract and difficult to understand (Raviv & Dadon, 2021). Therefore, strategies are needed to make astronomy learning more interesting, interactive, and accessible.

One of the main challenges in astronomy learning is the low interest of students in learning. Basic astronomy is one of the required courses that must be taken by students in the Astronomy program at the University of Muhammadiyah Sumatera Utara (UMSU). This course is essential as it serves as the foundation for studying further astronomy materials in subsequent stages. However, interviews with students enrolled in the Basic Astronomy course revealed that their interest in the subject remains relatively low. Interest in learning plays a crucial role as a motivator in the learning process, influencing learning satisfaction and enhancing academic performance and learning outcomes (Asih & Imami, 2021). Students with a high interest in learning tend to achieve better academic performance, and vice versa

(Liliana et al., 2020). If students have a low interest in the Basic Astronomy course, they are likely to struggle to understand the material taught and tend to achieve lower learning outcomes.

Interest reflects an individual's tendency and preference toward a particular object or group of objects, encompassing cognitive and affective aspects (Keller et al., 2017). Interest is defined as a persistent tendency to pay attention to and remember certain activities (Ayuningtyas & Wijayaningsih, 2020). Students who are interested in a subject will study it seriously because it appeals to them (Fauzan & Muslimin, 2018). Learning interest is influenced by two factors, namely internal factors (physical and psychological) and external factors (culture, experience, family, school, and society) (Pohan et al., 2022). Learning interest has several indicators, namely being interested in participating in every lesson, having special attention to the subject, feeling happy to participate in the lesson, and being involved in the learning process (Aulia et al., 2021).

One strategy to increase learning interest is to use interactive learning media (Sari & Harjono, 2021). Interactive learning media allows students to not only be spectators but also to actively interact during learning (Ridwan et al., 2021). Such learning media can create a more engaging learning experience, improve learning outcomes, and make the material easier to understand (Huijun & Asaad, 2023). One characteristic of effective interactive learning media is its ability to encourage students to learn to achieve learning objectives through various available activities (Liliana et al., 2020). Learning media plays an important role in improving the effectiveness of learning, as well as students' interest in learning (Rosyiddin et al., 2023).

The learning media most used by teachers when teaching is PowerPoint (Raisal et al., 2024). However, the traditional use of PowerPoint often fails to sustain students' attention and interest over the long term (Arsyad, 2019). With the advancement of technology, PowerPoint can now be enhanced by utilizing the Visual Basic for Applications (VBA) feature. VBA is a programming language or macro specifically designed for Microsoft Office to automate manual operations (Anomeisa & Ernaningsih, 2020; Kalwar & Marri, 2021).

One of the advantages of VBA is its ease of use. The Visual Basic programming language is known to be easy to learn, and its visual programming techniques enable users to develop applications better (Hasana & Alifiani, 2019). Its advanced programming capabilities make PowerPoint flexible and interactive, supporting lively and engaging classroom teaching (Huijun & Asaad, 2023). An interactive PowerPoint has a positive influence on increasing students' interest in learning (Rosyiddin et al., 2023). Several studies have shown that VBA-based PowerPoint can increase students' interest in learning (Ernawati et al., 2020; Musoffa et al., 2020). However, no research has been conducted on the application of VBA-based PowerPoint learning media to increase students' interest in learning in the context of astronomy education. Therefore, this study aims to determine the effectiveness of VBA-based PowerPoint as an interactive learning media to enhance interest in learning astronomy.

METHOD

The research design employed was a Pre-Experimental Design with a One-Group Pretest-Posttest Design. A Pre-Experimental Design with a One-Group Pretest-Posttest Design is one of the experimental designs that uses a single sample group and conducts measurements before and after the treatment is administered to the sample (Arliana et al., 2022). This research design was chosen due to the limited sample size available in the Astronomy program at UMSU. The sampling technique used in this study was random sampling. The research subjects were 20 second-semester students from the Astronomy program at the University of Muhammadiyah Sumatera Utara. Research data were collected using a questionnaire. The questionnaire used in this study was adapted from the questionnaire developed by Aulia (Aulia et al., 2021). This questionnaire contained 18 statements consisting of positive and negative statements, as presented in Table 1. A questionnaire containing positive and negative statements can make respondents give serious answers and not just random answers (Soesana et al., 2023).

Table 1. Number of statements for each aspect of learning interest

Aspect	Statement		Total
	Positive	Negative	
Interest	2	2	4
Attention	3	1	4
Feeling of happiness	3	2	5
Involvment	4	1	5

This questionnaire was designed using a Likert scale with four response options for each statement: strongly agree, agree, disagree, and strongly disagree. The Likert scale, with four response options, was used to allow respondents to indicate their attitude, whether they agreed or disagreed with a statement, thereby minimizing the middle-of-the-road bias. The scores for each statement are differentiated between positive and negative statements, as shown in Table 2.

Table 2. Scoring of each statement

Answer	Statement	
	Positive	Negative
Strongly agree	4	1
Agree	3	2
Disagree	2	3
Strongly disagree	1	4

The data analysis techniques used in this study were descriptive data analysis and inferential statistical analysis. Learning interest data was converted into a percentage of learning interest based on equation 1.

$$P = \frac{m}{M} \times 100\% \qquad (1)$$

Description:
P = percentage of interest
m = total score of learning interest
M = maximum score of learning interest

The percentage of learning interest was then grouped into five categories as shown in Table 3.

Table 3. Learning interest categories (Aulia et al., 2021)

Criteria	Category
$80\% < P \leq 100\%$	Very high
$60\% < P \leq 80\%$	High
$40\% < P \leq 60\%$	Sufficient
$20\% < P \leq 40\%$	Low
$P < 20\%$	Very low

The effectiveness of using PowerPoint based on VBA on learning interest was tested using the Paired Sample T-Test. Before conducting the Paired Sample T-Test, a prerequisite test was performed. The prerequisite test conducted was only a normality test without a homogeneity test because there was no comparison group. Data normality was tested using the Shapiro-Wilk test because the sample size was less than 50 people. The normality test and Paired Sample T-Test in this study were conducted using SPSS version 25.

RESULT AND DISCUSSION

The appearance of the learning media design using PowerPoint can be seen in Figure 1. The main page contains four menus: subject matter, quizzes, media guides, and competencies. A logo symbolizes

each menu and uses a hyperlink feature to go to the slide that corresponds to the selected menu. It is done so that the learning media becomes more interactive.
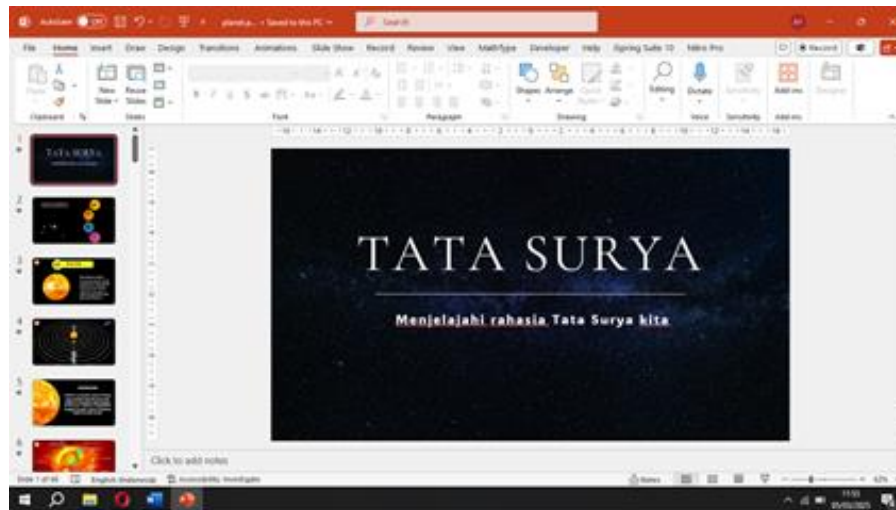

Figure 1. Display of the VBA-based PowerPoint

VBA code is used in the quiz menu. The quiz consisted of 20 multiple-choice questions. VBA code was used to randomize the questions that would be displayed, provide "correct" or "incorrect" responses when students answered the quiz, and assign scores based on the students' answers. Figure 2 shows the VBA code used to score students' answers.

```
Sub CorrectAnswer()
Output = MsgBox("Jawaban Anda benar!", vbInformation, "Jawaban benar!")
nCorrect = nCorrect + 1
nPoints = nPoints + 10 'Points for Correct Answer
UpdatePoints
NextSlide
End Sub

Sub WrongAnswer()
Output = MsgBox("Jawaban Anda salah!", vbCritical, "Jawaban salah!")
nWrong = nWrong + 1
nPoints = nPoints - 0 'Negative Points for Wrong Answer
UpdatePoints
NextSlide
End Sub
```

Figure 2. VBA code for answer choices

Table 4 shows the minimum, maximum, mean, and standard deviation scores obtained by students on each learning interest indicator before and after using PowerPoint based on VBA in basic astronomy learning. The maximum scores that can be obtained for the indicators of interest, attention, enjoyment, and involvement are 16, 16, 20, and 20, respectively.

Figure 1 presents a percentage diagram of students' learning interests based on four indicators: interest, attention, enjoyment, and involvement, both before and after using VBA-based PowerPoint in basic astronomy learning. The green and red bars represent the percentage of students' learning interest before and after using VBA-based PowerPoint, respectively. The indicators of interest, attention, enjoyment, and involvement before using VBA-based PowerPoint obtained percentages of 43.13%, 44.06%, 43.50%, and 41.75%, respectively. All four indicators fall into the "sufficient" category. The engagement indicator had the lowest percentage compared to the other indicators before using VBA-

based PowerPoint. This is because during lectures, students often listen to the lecturer present the material without being actively engaged in the learning process.

Table 4. Minimum, Maximum, Average, and Standard Deviation Scores Obtained by Students Before and After Using VBA-Based PowerPoint

Indicator	Pre				Post			
	Min	Max	Average	STD	Min	Max	Average	STD
Interest	5	9	6,9	0,91	11	16	14	1,21
Attention	5	8	7,05	0,83	12	16	13,85	1,18
Feeling of happiness	7	10	8,7	0,92	15	19	16,6	1,05
Involvment	6	10	8,35	1,18	15	20	17,35	1,42

The percentage of students' interest in learning increased after using VBA-based PowerPoint compared to before using VBA-based PowerPoint, as shown in Figure 3. The indicators of interest, attention, enjoyment, and engagement after using VBA-based PowerPoint obtained percentages of 87.50%, 86.56%, 83.00%, and 86.75%, respectively. All four indicators fall into the "very high" category. The interest indicator received the highest score compared to the other indicators after using VBA-based PowerPoint. This is because students believe that VBA-based PowerPoint can display animations and provide interactive quizzes.
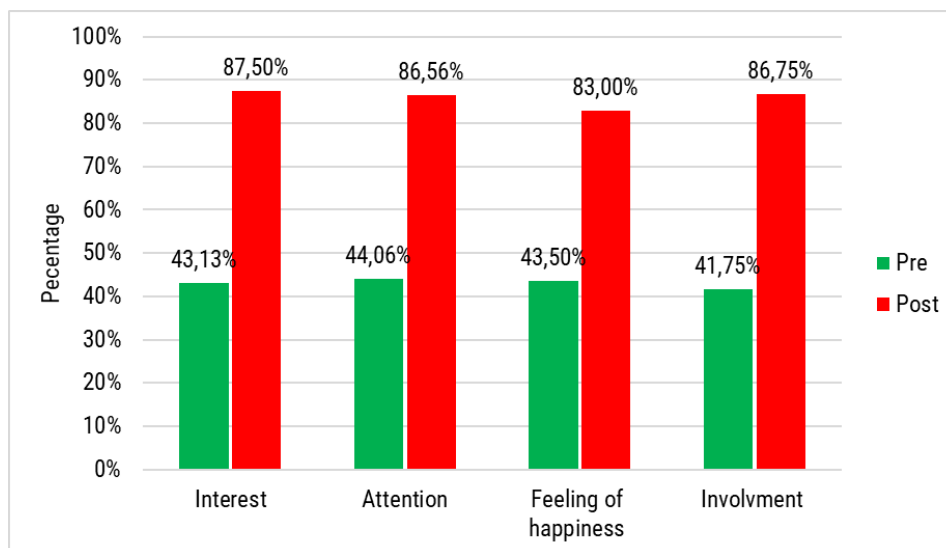

Figure 3. Percentage of Learning Interest Indicators Before and After Using VBA-Based PowerPoint

Table 5 shows the results of the normality test before and after using VBA-based PowerPoint. The normality test was conducted to determine whether the research data were normally distributed or not. The normality test in this study used the Shapiro-Wilk test with a significance level of 0.05. The Shapiro-Wilk test was used because the sample size was 20 people or fewer than 50 people. The results of the normality test of the data showed that the questionnaire results before and after using VBA-based PowerPoint had significance values of 0.256 and 0.860, respectively. Both values were greater than 0.05, indicating that the data were normally distributed.

Table 5. Results of The Data Normality Test

	Shapiro-Wilk		
	Statistic	df	Sig.
Pre	0.941	20	0.256
Post	0.975	20	0.860

After determining that the data was normally distributed, the next step was to perform a Paired Sample T-Test. The average learning interest scores of students in Basic Astronomy before and after using VBA-based PowerPoint learning media can be seen in Table 6. The maximum score that can be obtained is 72. Before using the VBA-based PowerPoint learning media, the average learning interest score of students was 31.00 or 43.06%, which falls into the "sufficient" category. Meanwhile, after using the media, the average learning interest score of students increased to 61.80 or 85.83%, which falls into the "very high" category.

Table 6. Paired Sample Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre	31.00	20	2.294	0.513
	Post	61.80	20	2.546	0.569

The results of the Paired Sample T-Test showed that the significance value (2-tailed) obtained was 0.000, as seen in Table 7. This significance value is less than 0.05, indicating a statistically significant difference between the average learning interest before and after using VBA-based PowerPoint in basic astronomy learning. Based on these test results, it can be concluded that the use of VBA-based PowerPoint is effective in increasing learning interest in basic astronomy learning.

Table 7. Paired Sample T-Test Results

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre - Post	-30.800	2.745	.614	-32.085	-29.515	-50.173	19	0.000

The research results showed that the use of interactive VBA-based PowerPoint learning media significantly increases students' learning interest in basic astronomy learning. This was evident from the increase in learning interest scores on the indicators of interest, attention, enjoyment, and student involvement after the implementation of this media. After using VBA-based PowerPoint, students' learning interest, which was initially in the "sufficient" category, increased to the "very high" category. These research results were consistent with Hermawan's research, which showed that interactive PowerPoint can improve students' learning interest (Hermawan et al., 2024). This increase reflects the effectiveness of interactive media in building interest in material that was previously considered abstract and difficult to understand.

VBA-based PowerPoint provides interactive features not available in conventional PowerPoint. Features such as navigation buttons, animations, interactive quizzes, and immediate feedback make the learning process more engaging and less monotonous. This aligns with Sari's view that interactive learning media make learning more engaging, thereby encouraging students to be more active and interested in the learning process (Sari & Harjono, 2021). Students who are actively involved in learning tend to achieve higher success. Fikrie and Ariani stated that student engagement fosters positive feelings and encourages students to continue their activities with perseverance and confidence, which can determine their success in school (Fikrie & Ariani, 2019).

VBA-based PowerPoint can present material in a more interesting, enjoyable, and easy-to-understand way. Dynamic and interactive visual displays can create a positive learning experience that directly impacts students' attention. Khotimah emphasized that the use of interactive visual media will help focus students' attention so that the information conveyed by the teacher can be more easily understood by students (Khotimah et al., 2019). Not only does it increase student attention, but VBA-based PowerPoint presentations also foster a sense of joy during the learning process. This is supported by Purwandari's research, which stated that VBA-based PowerPoint can make students more focused and enthusiastic about learning (Purwandari et al., 2022). This sense of enjoyment can also help students

understand the lesson. This aligns with Yolviansyah's view that students who enjoy a subject are motivated to continue learning it until they achieve a deep understanding of the subject (Yolviansyah et al., 2021). Furthermore, Fikri and Ariani stated that feelings of enjoyment in learning activities are very important in fostering students' attachment to the class and influencing their willingness to learn (Fikrie & Ariani, 2019). Thus, VBA-based PowerPoint not only increases student attention but also creates a pleasant learning atmosphere and encourages deeper engagement.

CONCLUSION

This study aims to investigate the effectiveness of VBA-based PowerPoint as an interactive media to increase students' interest in learning astronomy. The findings confirmed that VBA-based PowerPoint interactive learning media can increase students' interest in learning basic astronomy. This media can significantly increase learning interest in four indicators, namely interest, attention, enjoyment, and engagement. This improvement was evident from the change in students' learning interest categories, from "sufficient" to "very high" after using this media. These findings support the theory that interactive and automated media can enhance student engagement in abstract science topics such as astronomy. Practically, this implies that teachers can adopt PowerPoint enhanced with VBA as a cost-effective and easily accessible tool to stimulate learning interest in complex subjects.

However, these results should be interpreted cautiously due to limitations such as a small sample size, the absence of a control group, and the use of a pre-experimental design, which may affect internal validity. Future research is recommended to adopt a quasi-experimental design, involve a more diverse group of participants, and examine the long-term effects of VBA-based media on student motivation and learning outcomes. With a more robust methodological approach, it is hoped that future research findings will provide more valid and generalizable contributions in a broader educational context.

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REFERENCES

Ampartzaki, M., Tassis, K., Kalogiannakis, M., Pavlidou, V., Christidis, K., Chatzoglidou, S., & Eleftherakis, G. (2024). Assessing the Initial Outcomes of a Blended Learning Course for Teachers Facilitating Astronomy Activities for Young Children †. *Education Sciences*, *14*(6), 1–29. https://doi.org/10.3390/educsci14060606

Anomeisa, A. B., & Ernaningsih, D. (2020). Media Pembelajaran Interaktif Menggunakan PowerPoint VBA Pada Penyajian Data Berkelompok. *Jurnal Pendidikan Matematika Raflesia*, *5*(1), 17–31.

Arliana, B., Putri, R. D., & Sari, S. P. (2022). Peningkatan Self-disclosure melalui Bimbingan Kelompok pada Siswa Kelas X di SMA Negeri 1 Rambang Niru. *Jurnal Pendidikan Dan Konseling*, *4*(4), 1120–1123.

Arsyad, A. (2019). *Media Pembelajaran*. Rajawali Pers.

Asih, & Imami, A. I. (2021). Analisis Minat Belajar Siswa Smp Pada Pembelajaran Matematika. *Jurnal Pembelajaran Matematika Inovatif*, *4*(4), 799–808. https://doi.org/10.22460/jpmi.v4i4.799-808

Aulia, S., Zetriuslita, Amelia, S., & Qudsi, R. (2021). Analisis Minat Belajar Matematika Siswa dalam Menggunakan Aplikasi Scratch pada Materi Trigonometri. *Juring (Journal for Research in Mathematics Learning)*, *4*(3), 205–214. https://doi.org/10.33087/phi.v8i1.360

Ayuningtyas, T. Y., & Wijayaningsih, L. (2020). Efektivitas Permainan Detumbar (Dengarkan, Temukan gambar) terhadap Minat Belajar Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *5*(1), 814–822. https://doi.org/10.31004/obsesi.v5i1.724

Clemente, S. B., Liñan, F. S., Paulini, J. Z., & Carbonell, M. C. (2022). Augmented reality mobile application to improve the astronomy teaching-learning process. *Advances in Mobile Learning Educational Research*, *2*(2), 464–474. https://doi.org/10.25082/amler.2022.02.015

Ernawati, Nurhayati, L., & Chotimah, S. (2020). Analisis Pengaruh Penggunaan Visual Basic Application Terhadap Minat Belajar Matematika Siswa SD pada Materi Bilangan Prima. *Edumatica : Jurnal Pendidikan Matematika*, *10*(1), 19–26. https://doi.org/10.22437/edumatica.v10i01.7948

Fauzan, I., & Muslimin. (2018). Efektifitas Metode Sorogan dalam Meningkatkan Minat Belajar Santri di Madrasah Diniyyah Haji Ya'qub Lirboyo Kediri. *Jurnal Intelektual: Jurnal Pendidikan Dan Studi Keislaman*, *8*(1), 69–80.

Fikrie, & Ariani, L. (2019). Keterlibatan Siswa (Student Engagement) Di Sekolah sebagai Salah Satu Upaya Peningkatan Keberhasilan Siswa di Sekolah. *Prosiding Seminar Nasional & Call Paper Psikologi Pendidikan 2019*, *13*, 103–110.

Hasana, S. N., & Alifiani, A. (2019). Multimedia Development Using Visual Basic for Application (VBA) to Improve Students' Learning Motivation in Studying Mathematics of Economics. *Indonesian Journal of Mathematics Education*, *2*(1), 34–42. https://doi.org/10.31002/ijome.v2i1.1230

Hermawan, T., Khairiani, D., Muthmainnah, M., Saifullah, I., & Bisri, H. (2024). Pengaruh Penggunaan Media Pembelajaran Powerpoint Interaktif Terhadap Minat Belajar Matematika Siswa Kelas VII Madrasah Tsanawiyah. *Asas Wa Tandhim: Jurnal Hukum, Pendidikan Dan Sosial Keagamaan*, *3*(2), 87–98. https://doi.org/10.47200/awtjhpsa.v3i2.2173

Huijun, N., & Asaad, H. Q. M. (2023). Application of powerpoint and the visual basic for applications programming language in interactive educational software. *Kurdish Studies*, *11*(2), 3215–3225.

Kalwar, M. A., & Marri, H. B. (2021). Performance Improvement of Sale Order Detail Preparation by Using Visual Basic for Applications: A Case Study of Footwear Industry. *International Journal of Business Education and Management Studies*, *3*(1), 1–22. https://www.researchgate.net/publication/356943752

Keller, M. M., Neumann, K., & Fischer, H. E. (2017). The impact of physics teachers' pedagogical content knowledge and motivation on students' achievement and interest. *Journal of Research in Science Teaching*, *54*(5), 586–614. https://doi.org/10.1002/tea.21378

Khotimah, H., Supena, A., & Hidayat, N. (2019). Meningkatkan attensi belajar siswa kelas awal melalui media visual. *Jurnal Pendidikan Anak*, *8*(1), 17–28. https://doi.org/10.21831/jpa.v8i1.22657

Liliana, R. A., Raharjo, W., Jauhari, I., & Sulisworo, D. (2020). Effects of the online interactive learning media on student's achievement and interest in physics. *Universal Journal of Educational Research*, *8*(3 B), 59–68. https://doi.org/10.13189/ujer.2020.081507

Lisboa, S. P., Binimelis, C. R., & Allaria, J. C. (2020). Augmented reality and stellarium: astronomy for children of five years. *Alteridad. Revista de Educación*, *15*(1), 24–33. https://doi.org/10.17163/alt.v15n1.2020.02

Musoffa, D. Q., Nurhayati, A., & Chotimah, S. (2020). Analisis Minat Belajar Siswa Kelas III Pada Materi Bangun Datar Berbantuan VBA. *Journal on Education*, *2*(4), 297–302. https://doi.org/10.31004/joe.v2i4.322

Pohan, S., Mavianti, M., Setiawan, H. R., & Marpaung, A. H. (2022). Meningkatkan Minat Belajar Siswa dengan Menggunakan Media Bergambar dan Power Point Pada Mata Pelajaran Fiqih. *Edukasi Islami: Jurnal Pendidikan Islam*, *11*(3), 779–788. https://doi.org/10.30868/ei.v11i03.2446

Purwandari, A. S., Rohaeti, E. E., & Putra, H. D. (2022). Pembelajaran Discovery Learning Berbasis VBA Microsoft PowerPoint Materi Bangun Ruang Sisi Datar pada Siswa SMP. *Journal of Authentic Reasearch on Mathematics Education (JARME)*, *4*(1), 98–108.

Raisal, A. Y., Rakhmadi, A. J., & Hidayat, M. (2024). The Development of Android-Based Interactive Learning Media on the Topic of Discussing the Atmosphere. *Journal of Physics: Conference Series*, *2773*(1), 1–6. https://doi.org/10.1088/1742-6596/2773/1/012023

Raviv, A., & Dadon, M. (2021). Teaching astronomy in kindergarten: Children's perceptions and projects. *Athens Journal of Education*, *8*(3), 305–328. https://doi.org/10.30958/aje.8-3-4

Ridwan, Y. H., Zuhdi, M., Kosim, K., & Sahidu, H. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Model Problem Based Learning Untuk Meningkatkan Kemampuan Berpikir Kreatif Fisika Peserta Didik. *Orbita: Jurnal Kajian, Inovasi Dan Aplikasi Pendidikan Fisika*, *7*(1), 103–108. https://doi.org/10.31764/orbita.v7i1.3832

Rosyiddin, A. A. Z., Fiqih, A., Nugraha, H., Hadiapurwa, A., & Komara, D. A. (2023). The Effect of Interactive

PowerPoint Media Design on Student Learning Interests. *Edcomtech: Jurnal Kajian Teknologi Pendidikan*, *8*(1), 12–23.

Sari, R. K., & Harjono, N. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Articulate Storyline Tematik Terhadap Minat Belajar Siswa Kelas 4 SD. *Jurnal Pedagogi Dan Pembelajaran*, *4*(1), 122–130. https://doi.org/10.23887/jp2.v4i1.33356

Soesana, A., Subakti, H., Karwanto, Fitri, A., Kuswandi, S., Sastri, L., Falani, I., Aswan, N., Hasibuan, F. A., & Lestari, H. (2023). *Metodologi Penelitian Kuantitatif*. Yayasan Kita Menulis.

Timur, S., Yalçınkaya-önder, E., Timur, B., & Özeş, B. (2020). Astronomy education for preschool children: Exploring the sky. *International Electronic Journal of Elementary Education*, *12*(4), 383–389. https://doi.org/10.26822/iejee.2020459467

Yolviansyah, F., Suryanti, S., Setiya Rini, E. F., Matondang, M. M., & Wahyuni, S. (2021). Hubungan Minat Belajar Siswa Terhadap Hasil Belajar Fisika Di Sma N 3 Muaro Jambi. *Tunjuk Ajar: Jurnal Penelitian Ilmu Pendidikan*, *4*(1), 16–25. https://doi.org/10.31258/jta.v4i1.16-25