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Developing of PowerPoint Based on Visual Basic for Application as an Interactive Learning Media to Increase Learning Interest

Abu Yazid Raisal[1)*], Muhammad Hidayat[1)], Nurul Zahriani Jf[2)]

[1)]Study Program of Islamic Astronomy, Universitas Muhammadiyah Sumatera Utara, Medan, 20238, Indonesia
[2)]Study Program of Early Childhood Islamic Education, Universitas Muhammadiyah Sumatera Utara, Medan, 20238, Indonesia

**Corresponding author: abuyazidraisal@umsu.ac.id*

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Abstract – *Student interest in astronomy has often been reported as relatively low due to the abstract nature of its concepts, reliance on mathematical reasoning, and the dominance of English-language resources, which collectively reduce motivation and engagement. This condition underlines the urgency of developing innovative learning media that not only deliver content but also actively stimulate curiosity and participation. The present study aimed to develop and validate interactive learning media for the fundamental astronomy course at Universitas Muhammadiyah Sumatera Utara by utilizing Microsoft PowerPoint integrated with Visual Basic for Applications (VBA). Employing a Research and Development approach based on the ADDIE model, the research was limited to the analysis, design, and development stages, followed by expert validation. The developed media incorporated hyperlink navigation, animations, three-dimensional models, and randomized quizzes with automated scoring and feedback. Validation results indicated that the product achieved an average score of 90.3% from media experts and 96.8% from material experts, both categorized as very valid according to established criteria. These findings confirm the reliability of the product in terms of technical quality, interactivity, and content accuracy. The novelty of this study lies in repurposing a widely available platform into an advanced instructional tool by embedding VBA programming, thereby expanding the pedagogical possibilities of conventional presentation software. In conclusion, the VBA-based PowerPoint media was proven to be highly valid and holds strong potential to enhance students' learning interest in astronomy. This research contributes to the field of physics education by providing a validated framework for developing interactive, discipline-specific digital learning resources.*

Keywords: *astronomy education; interactive learning media; power point-based instruction; visual basic for application*

I. INTRODUCTION

Education plays a pivotal role in shaping human resources capable of responding to the challenges of the 21st century, where knowledge, creativity, and innovation are central to sustainable development. One of the enduring challenges faced by educators worldwide is

maintaining student engagement and preventing boredom during the learning process. A lack of interest in learning can significantly hinder academic achievement and limit students' capacity to apply knowledge in real-world contexts (Rosyiddin et al., 2023). Interest in learning functions as a crucial motivational factor that drives students' persistence, participation, and satisfaction (Asih & Imami, 2021). When students develop a strong interest in a subject, they are more likely to pay attention, participate actively, and demonstrate persistence in solving problems, thereby improving their overall achievement (Lai et al., 2024; Pohan et al., 2022). Conversely, low levels of interest often lead to disengagement, superficial learning, and rejection of instructional efforts (Fatimah et al., 2021). Thus, strategies to stimulate students' learning interest are a primary concern in contemporary educational research and practice (Aulia et al., 2021).

Among various disciplines, astronomy holds unique potential to inspire curiosity and cultivate scientific thinking. As a field that connects everyday experiences with broader cosmic phenomena, astronomy can nurture both cognitive skills and affective dispositions toward science (Pertiwi et al., 2022). In higher education, particularly within specialized programs such as the Astronomy Study Program at Universitas Muhammadiyah Sumatera Utara (UMSU), Fundamental Astronomy is a compulsory course that underpins advanced studies in astronomy. However, interviews with lecturers revealed that students' interest in astronomy is relatively low, potentially due to the abstract nature of its concepts and the fact that students are often exposed to astronomy only at the university level. This low interest negatively affects comprehension and performance in related subjects (Ayuningtyas & Wijayaningsih, 2020). Information and Communication Technology (ICT) has been widely recognized as a means to overcome these challenges. Properly designed digital learning media can bridge the gap between abstract content and concrete student experiences by providing interactive visualizations, simulations, and opportunities for exploration (Liliana et al., 2020; León & García-Martínez, 2021).

Despite the potential of ICT, current instructional practices at UMSU reveal that PowerPoint, the most commonly used medium, remains predominantly static, functioning only as a slide show of textual and visual information. While such tools assist in structuring lectures, they do not engage students in active learning nor sufficiently stimulate their curiosity. This situation contributes to persistent low interest in learning astronomy, which, if left unaddressed, may result in poor academic outcomes and declining motivation. Conventional PowerPoint presentations are also limited in their capacity to provide interactivity, feedback, and immersive experiences necessary to sustain engagement in complex subjects (Pramesti et al., 2021; Sakiah & Effendi, 2021). Therefore, the central research problem addressed in this study is the lack of interactive, engaging, and pedagogically effective media in the teaching of Fundamental Astronomy at UMSU.

A general solution to this issue lies in adopting innovative, student-centered instructional approaches that leverage technology to create engaging learning environments. Studies in educational technology emphasize that the design of learning media should not only transmit information but also stimulate active participation, curiosity, and problem-solving (Egara & Mosimege, 2024). One promising avenue is the integration of programming features into commonly available presentation tools to transform them into interactive platforms. The development of interactive media aligns with global trends in higher education, where ICT-based learning is increasingly used to enhance student engagement, personalize learning experiences, and accommodate diverse learning styles (Djajadi, 2019; Febrina & Setiawan, 2024). In the context of astronomy education, interactive media can visualize celestial motions, simulate observational phenomena, and provide practice through digital quizzes, thereby making abstract concepts more accessible and stimulating for learners.

Visual Basic for Applications (VBA) embedded in Microsoft PowerPoint offers a feasible and innovative solution to this challenge (Kalwar & Marri, 2021). Unlike conventional slides, VBA enables the creation of dynamic hyperlinks, animations, quizzes with randomized items, and automated scoring systems that provide immediate feedback (Bernard & Chotimah, 2018; Chotimah & Manoy, 2021). Previous research has demonstrated that VBA-based PowerPoint can enhance spatial reasoning, support open-ended learning approaches, and improve student performance in mathematics and science (Rohaeti et al., 2019; Fauzi & Shodiq, 2022). In addition, studies confirm that interactive media, such as PowerPoint with 3D models and hyperlink functions, significantly increase student interest and learning outcomes compared to traditional methods (Trinovita & Ratnasari, 2023; Habibah & Napitupulu, 2021). In this regard, VBA-based PowerPoint holds the potential to transform astronomy instruction from static delivery to interactive exploration, thus fostering deeper engagement and higher motivation.
A growing body of literature has examined the use of ICT and interactive media in physics and science education. For instance, studies have highlighted the effectiveness of Android-based applications in atmospheric science (Raisal et al., 2024), e-modules for astrophysics competitions (Julianti et al., 2022), and online interactive media in physics instruction (Liliana et al., 2020). Other research has demonstrated the positive effects of integrating fun learning models (Pertiwi et al., 2022) and interactive features, such as hyperlinks and 3D models, into PowerPoint presentations (Pramesti et al., 2021; Trinovita & Ratnasari, 2023). While these studies underscore the benefits of interactive digital media, few have specifically focused on the systematic development and validation of VBA-based PowerPoint for astronomy education at the higher education level (Hasana & Alifiani, 2019). Furthermore, existing research often addresses general science or mathematics subjects rather than astronomy, a field that poses distinct challenges due

to its reliance on abstract and large-scale phenomena. This gap indicates a pressing need for empirical studies that develop, validate, and assess the potential of VBA-based PowerPoint to enhance learning interest in astronomy courses.

This study aims to develop an interactive learning medium using PowerPoint with VBA programming to enhance students' interest in Fundamental Astronomy at UMSU. Employing the ADDIE development model, the research focuses on the development and expert validation stages, ensuring the quality and feasibility of the media before classroom implementation. The novelty of this study lies in its integration of VBA coding, 3D models, hyperlink navigation, and automated randomized quizzes within a PowerPoint platform tailored for astronomy education. Unlike previous research that has primarily explored ICT applications in general science or mathematics, this study provides a discipline-specific contribution by addressing low interest in astronomy learning at the university level. By validating the media through expert assessments of both content and technical design, the study establishes a foundation for future investigations into its effectiveness. Ultimately, the findings are expected to contribute to the literature on educational technology by demonstrating how widely accessible software can be repurposed into sophisticated, interactive media that can transform student engagement in higher education contexts.

II. METHODS

This research employed a Research and Development (R&D) approach to design and validate innovative instructional products before implementing them in real classroom settings (Aiyesi et al., 2025). The choice of the R&D method was appropriate because the primary objective of this study was to produce a valid and reliable learning medium that could enhance students' interest in studying Fundamental Astronomy. The development framework followed the ADDIE model, consisting of five sequential phases: analysis, design, development, implementation, and evaluation. As shown in Figure 1, the ADDIE model provides a structured pathway for instructional design by emphasizing systematic needs analysis, iterative product development, and rigorous evaluation (Branch, 2009). Given the exploratory nature of this research, the focus was limited to the first three stages: analysis, design, and development, while implementation and evaluation are intended for future studies.

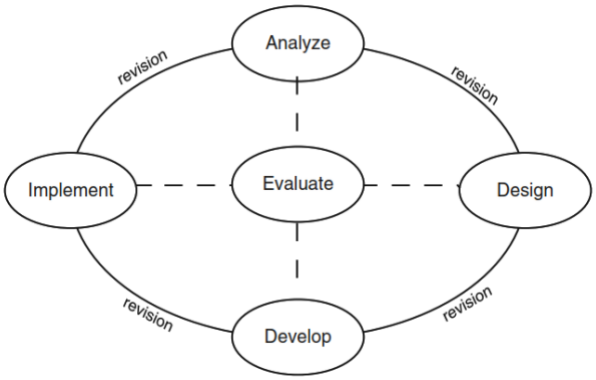

Figure 1. ADDIE development stage (Branch, 2009)

At the analysis stage, preliminary data were obtained through semi-structured interviews with lecturers of the Fundamental Astronomy course at UMSU. The aim was to identify specific problems encountered in teaching and learning processes. The findings revealed that students perceived astronomy as a complex subject, particularly due to its abstract concepts, reliance on mathematical formulations, and the use of English-language resources, which created additional difficulties for comprehension. Classroom observations confirmed that while PowerPoint was frequently employed as a presentation tool, it was generally limited to static slides. This lack of interactivity reduced student engagement, consistent with studies reporting that conventional presentation media often fail to stimulate active learning (Arsyad, 2019; Djajadi, 2019). Therefore, the analysis stage concluded with the need to design a more interactive, accessible, and engaging learning medium.

The design stage consisted of conceptual planning of the media's structure, instructional features, and validation instruments. PowerPoint was selected as the platform because of its accessibility, familiarity among lecturers, and compatibility with VBA. The design included multiple components: astronomy material content, usage guides, competency indicators, and integrated quizzes. The quizzes were intended to foster student engagement through practice and immediate feedback. At the same time, the instructional material was enhanced with features such as hyperlink navigation and animations to visualize astronomical phenomena. At this stage, validation instruments were also constructed in the form of questionnaires for experts. These instruments were based on a four-point Likert scale ranging from 1 (not good) to 4 (very good), aligning with previous validation studies in educational media development (Chotimah & Manoy, 2021).

The development stage involved translating the design into a fully functional prototype using Microsoft PowerPoint integrated with VBA programming. VBA was utilized to create features that are not available in standard PowerPoint, including randomized quiz questions, automated scoring, and interactive feedback messages. The quiz component was programmed to present 20

multiple-choice questions, each carrying a score of 10 for correct answers and zero for incorrect ones. The automation of feedback allowed students to know instantly whether their answers were correct or incorrect, and at the end of the quiz, their total score was displayed. These features were intended to create an engaging learning experience by providing interactivity and reinforcing motivation through immediate feedback, which is effective in sustaining student interest (Bernard & Chotimah, 2018; Rohaeti et al., 2019).

To validate the developed product, a panel of experts was convened. The selection was purposive: media experts evaluated the technical aspects, including visual design, navigation, and integration of features, while material experts assessed content accuracy, instructional coherence, and linguistic clarity. Both groups used the Likert-scale questionnaires designed in the previous stage. The collected data were analyzed both qualitatively and quantitatively. Qualitative data consisted of written suggestions and feedback, which were incorporated into product revisions. Quantitative data were converted into percentage scores. The percentage of validity was calculated using Equation (1), where PPP represents the percentage score, TSe is the total score obtained, and TSh is the maximum score possible.

$$P = \frac{TSe}{TSh} \times 100\% \quad (1)$$

The interpretation of these scores followed the product validity criteria outlined in Table 1. Products with a percentage between 85.01% and 100% were classified as very valid, those between 70.01% and 85% as valid, scores ranging from 50.01% to 70% as less valid, and those below 50% as not valid. These benchmarks were consistent with the standards widely applied in previous validation studies (Chotimah & Manoy, 2021).

Table 1. Product validity criteria (Chotimah & Manoy, 2021)

Score interval	Criteria
85.1% - 100.00%	Very valid
70.1% - 85.00%	Valid
50.1% - 70.00%	Less valid
1.00% - 50.00%	Not valid

III. RESULTS AND DISCUSSION

The results of this study present both the developed features of the VBA-based PowerPoint learning media for Fundamental Astronomy and the outcomes of expert validation. The findings are organized into two major subsections: (1) the product features illustrated through Figures 2–10, and (2) the validation results summarized in Tables 2 and 3. Together, these results provide a

comprehensive overview of both the qualitative and quantitative evaluation of the developed media.

The first aspect of the results relates to the visual and functional features of the product. Figure 2 illustrates the overall design of the learning media, created using Microsoft PowerPoint, which organizes the main interface into interactive sections. The interface features navigation buttons, hyperlinks, and menus that guide users to various sections of the content.

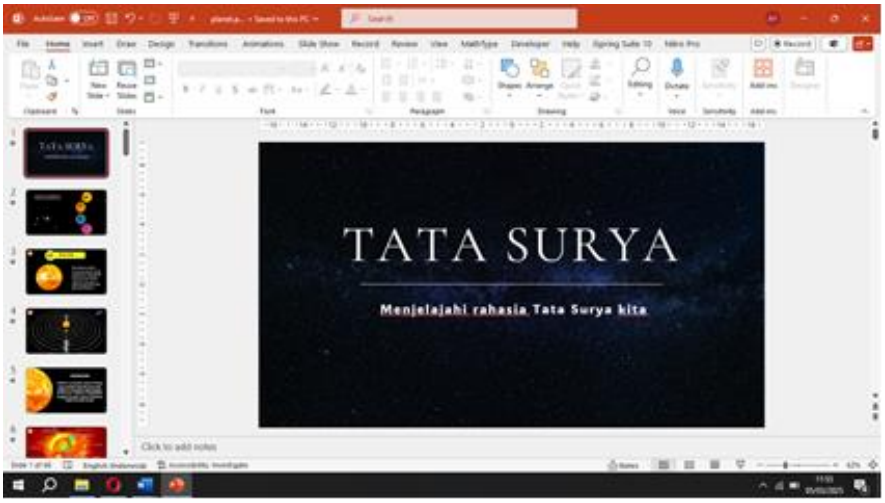

Figure 2. Display of the learning media design using PowerPoint

The product's homepage is shown in Figure 3, serving as the central navigation hub for students. The page incorporates hyperlinks that allow learners to move between modules, quizzes, and guidance sections without following a strictly linear sequence. This design provides learners with autonomy, enabling them to revisit material as needed.

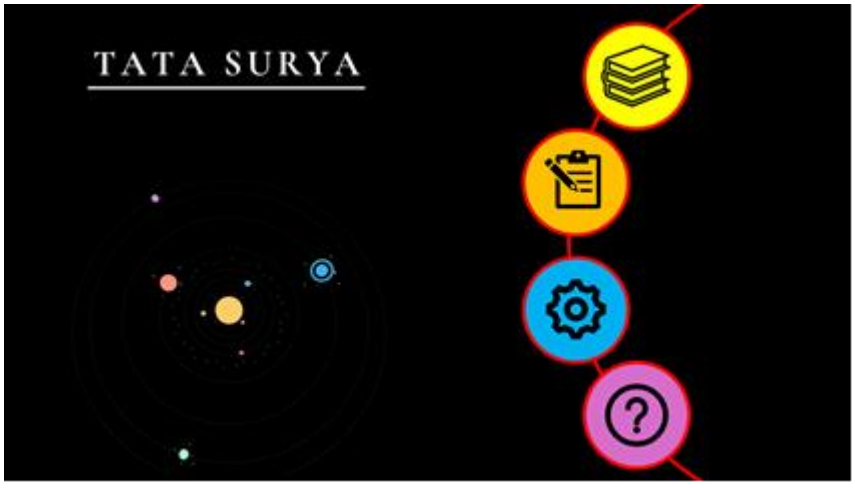

Figure 3. Display of the main page

To enhance the visualization of astronomical phenomena, Figure 4 illustrates the incorporation of three-dimensional (3D) models into the slides. The 3D models allow students to

manipulate and observe celestial objects from multiple perspectives, thereby helping them grasp abstract concepts. Similarly, Figure 5 illustrates the use of animation features to represent the dynamics of the Solar System.

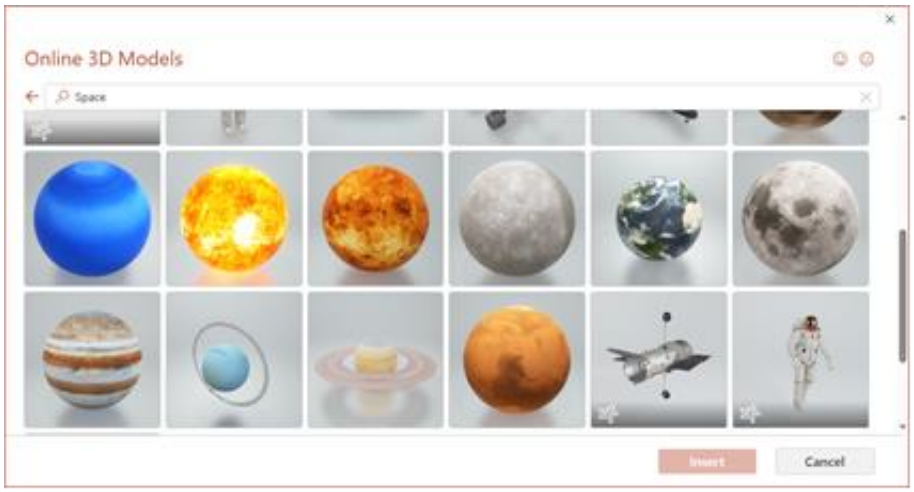

Figure 4. 3D model feature in PowerPoint

Figure 5. Use of animation features in the Solar System model

Interactivity was further enhanced through the quiz component. Figure 6 presents the display of multiple-choice questions that students encounter during the quiz sessions. To ensure variability, VBA coding was embedded to randomize the order of questions, as shown in Figure 7. The coding for randomizing answer choices is shown in Figure 8. This feature prevents predictability and encourages learners to engage in genuine problem-solving, rather than memorization.

Figure 6. Display of questions in the quiz

```
Sub ShuffleSlide()
FirstSlide = 46
LastSlide = 65

Randomize

For i = FirstSlide To LastSlide
    RSN = Int((LastSlide - FirstSlide + 1) * Rnd + FirstSlide)
    ActivePresentation.Slides(i).MoveTo (RSN)
Next i
ActivePresentation.SlideShowWindow.View.GotoSlide (45)
End Sub
```

Figure 7. VBA code to randomize questions

```
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 8. VBA code for answer choices

Immediate feedback mechanisms were also integrated. Figure 9 shows the message box that appears after each response, informing students whether their answer is correct or incorrect. This design was based on the principle that timely feedback is essential in reinforcing learning and maintaining motivation. Finally, Figure 10 illustrates the score slide that summarizes students' performance at the end of the quiz. The score report includes the number of correct and incorrect answers as well as the total score, providing learners with an opportunity to evaluate their progress.

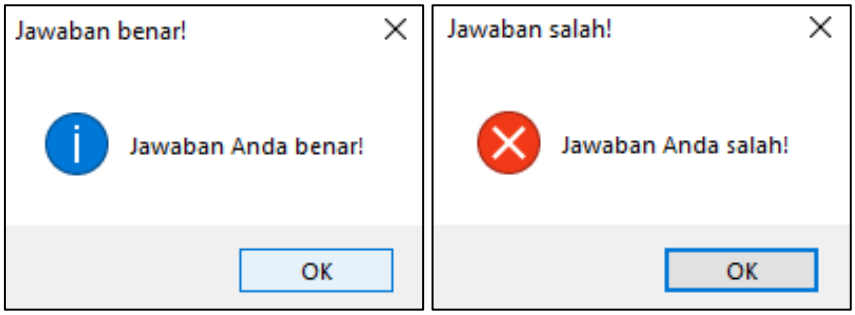

Figure 9. Message box display for each answer choice

Figure 10. Score slide showing student performance

The second aspect of the results concerns the validation outcomes. Media experts evaluated the product based on three indicators: visual presentation, navigation, and feature integration. As shown in Table 2, the average validity score reached 90.3%, which falls into the very valid category according to the criteria defined in Table 1. Experts noted that the visual design was attractive, navigation was intuitive, and features were well-integrated. Suggestions for improvement included harmonizing font sizes and adjusting color contrast to enhance readability.

Table 2. Results of validation by media experts

Aspect	Score (%)	Category
Visual presentation	92.2	Very valid
Navigation	85.0	Very valid
Feature integration	93.8	Very valid
Average	90.3	Very valid

Similarly, material experts validated the content, instructional construction, and language clarity. As summarized in Table 3, the average validity score reached 96.8%, which also falls into the very valid category. The content was considered accurate and comprehensive, instructional sequences were pedagogically coherent, and language use was clear. Experts suggested minor

refinements, such as simplifying technical terms and providing more contextual examples to improve accessibility for diverse learners.

Table 3. Results of validation by material experts

Aspect	Score (%)	Category
Content accuracy	98.2	Very valid
Instructional structure	94.6	Very valid
Language clarity	97.5	Very valid
Average	96.8	Very valid

Taken together, the findings confirm that the VBA-based PowerPoint media achieved strong validity across both technical and pedagogical dimensions. The inclusion of Figures 2–10 demonstrates the product's functional and visual features, while the quantitative data in Tables 2 and 3 provide empirical evidence of its validity. These outcomes collectively indicate that the developed media is ready for further stages of implementation and evaluation, where its effectiveness in improving students' interest and learning outcomes can be systematically tested.

The results of this study confirmed that the developed VBA-based PowerPoint media for the Fundamental Astronomy course achieved very high validity across both technical and pedagogical dimensions, with ratings of 90.3% from media experts and 96.8% from material experts. These findings highlight that the integration of VBA into PowerPoint not only enhances the interactive potential of a widely accessible platform but also addresses persistent challenges in teaching astronomy, which is often perceived as abstract and difficult (Pertiwi et al., 2022). The overall validation outcomes align with previous studies, which emphasize that interactive media can enhance student motivation and engagement by transforming passive learning environments into active and participatory experiences (Bernard & Chotimah, 2018; Rohaeti et al., 2019).

The contribution of Figures 2–10 further illustrates how specific product features shaped these positive evaluations. The overall design and main page, as shown in Figures 2 and 3, emphasized clarity, accessibility, and user-friendly navigation. The hyperlink-based structure enabled learners to explore the material flexibly, aligning with the principles of student-centered learning that emphasize autonomy and adaptive pathways (Djajadi, 2019). Experts noted that this design supported learners' ability to revisit and reinforce key concepts at their own pace, thereby potentially enhancing self-regulated learning. Such navigation features are consistent with León & García-Martínez (2021), who argued that intuitive design and interactive layouts are critical to sustaining learners' engagement with digital content.

The integration of visualizations through 3D models and animations (Figures 4 and 5) was considered a particularly strong aspect of the product. These features provided concrete

representations of celestial objects and orbital dynamics, thereby reducing the cognitive barriers posed by abstract astronomical concepts. Liliana et al. (2020) demonstrated that multimedia learning environments leveraging dual coding channels—visual and verbal—can significantly improve comprehension. Similarly, Trinovita & Ratnasari (2023) found that PowerPoint integrated with interactive visualizations improves conceptual mastery in science learning. In this study, the use of 3D models and animations directly addressed the gap between theoretical content and students' cognitive frameworks, which material experts recognized in their high evaluations of content accuracy and instructional structure.

The interactive quiz component, as illustrated in Figures 6–10, further contributed to the strong validation outcomes. The randomized question and answer features (Figures 7 and 8) reduced predictability, encouraging students to approach tasks with genuine problem-solving rather than rote memorization. This aligns with research suggesting that variability and unpredictability in assessments foster deeper cognitive engagement (Egara & Mosimege, 2024). Moreover, the immediate feedback system (Figure 9) and automated scoring (Figure 10) provided learners with timely information about their performance, a factor long recognized as essential in sustaining motivation and supporting formative assessment practices (Bernard & Chotimah, 2018). The validation from media experts reflected these strengths, with the interactivity and automation features cited as major contributors to the product's technical robustness.

The combination of strong visual design, interactive navigation, multimedia integration, and formative assessment capabilities explains why both expert groups classified the product as "very valid." These attributes collectively support the notion that educational technologies should not merely function as delivery tools but as environments that stimulate exploration, feedback, and reflection (Rosyiddin et al., 2023). The findings, therefore, extend prior research on PowerPoint-based instruction (Pramesti et al., 2021) by demonstrating that VBA coding can transform a conventional presentation platform into a dynamic, interactive medium with significant pedagogical potential (Hermawan et al., 2024).

Nevertheless, the study also acknowledges limitations identified by experts. The media requires Microsoft PowerPoint 2019 or later and functions optimally only on personal computers or laptops, limiting its compatibility with mobile devices (Rohima, 2021). These challenges are consistent with broader concerns about technological accessibility in digital learning environments (Habibah & Napitupulu, 2021). While these limitations do not undermine the product's current validity, they point to important directions for future development, such as adapting the product into web-based or mobile-friendly platforms. Doing so would enhance scalability and accessibility, aligning the media with current trends of mobile learning in higher education (Lai et al., 2024).

Another dimension worth discussing is the alignment of the present findings with broader pedagogical frameworks. The validation results suggest that the VBA-based PowerPoint media not only achieved technical and content validity but also addressed the motivational dimension of learning (Huijun & Asaad, 2023). Interest and motivation are essential components of effective learning environments, and prior research has established that interactive media can play a pivotal role in sustaining these affective factors (Asih & Imami, 2021; Rosyiddin et al., 2023). The inclusion of features such as instant feedback and flexible navigation supports the development of self-regulated learning, as students can monitor their progress and adjust their learning strategies accordingly. This aligns with contemporary pedagogical approaches that emphasize learner autonomy, formative assessment, and adaptive learning pathways.

IV. CONCLUSION AND SUGGESTION

The present study developed and validated interactive learning media based on Microsoft PowerPoint integrated with VBA for the Fundamental Astronomy course at UMSU. Guided by the ADDIE development model, the research focused on the stages of analysis, design, and development, followed by validation conducted by media and material experts. The results demonstrated that the product achieved validity scores of 90.3% from media experts and 96.8% from material experts, both of which were categorized as very valid. These findings suggest that the developed media effectively combine technical quality, interactive functionality, and pedagogical accuracy, providing a valuable tool to enhance student interest and engagement in astronomy learning.

Despite these promising outcomes, this study has certain limitations. The development and validation processes were limited to expert evaluation, without implementation and empirical testing in classroom settings. Moreover, the media requires Microsoft PowerPoint 2019 or later and functions optimally only on personal computers or laptops, which restricts its accessibility for mobile learning environments. Future research should therefore focus on classroom trials to assess the effectiveness of the media in improving students' interest and learning outcomes, as well as on adapting the product for cross-platform compatibility, including mobile and web-based applications. The contribution of this study lies in demonstrating how widely available software can be innovatively repurposed into interactive instructional tools through VBA integration, thereby expanding the repertoire of technology-enhanced learning media in physics education and providing a reference point for further development of discipline-specific digital resources.

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