JURNAL ABSIS
Jurnal Pendidikan Matematika dan Matematika
Vol. 8 No. 1, April 2025

DEVELOPMENT OF ISPRING-ASSISTED INTERACTIVE LEARNING MEDIA TO SUPPORT STUDENTS' SELF-REGULATED LEARNING ON FLAT-SIDED GEOMETRIC SOLIDS

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ABSTRACT This research was motivated by the importance of fostering student independence in learning, particularly through the development of self-regulated learning, which does not emerge without external support. The aim of this study is to develop interactive learning media assisted by iSpring that meet the criteria of validity and practicality, in order to support students' self-regulated learning and help eighth-grade junior high school/madrasah students understand the topic of flat-sided geometric solids. The development process follows the ADDIE model. The test subjects consisted of eighth-grade students at SMPN 20 Pekanbaru. Data were collected through interviews and questionnaires, using instruments such as expert validation sheets, student response questionnaires, and a self-regulated learning questionnaire. Validation results indicated that the media was classified as "very valid" with an average score of 3.76. In the small group trial, student responses yielded an average score of 0.92 ("very practical"), while the self-regulated learning score averaged 77.51% ("good"). In the large group trial, student responses had an average score of 0.81 ("practical"), and the self-regulated learning score was 79.61% ("good"). These results indicate that the developed learning media meets the criteria of being both valid and practical.

Keywords: interactive learning media, iSpring, self-regulated learning, flat-sided geometric solids

ABSTRAK Penelitian ini dilatarbelakangi oleh pentingnya menumbuhkan kemandirian belajar siswa, khususnya melalui pengembangan self-regulated learning yang tidak muncul secara alami tanpa dukungan eksternal. Tujuan dari penelitian ini adalah untuk mengembangkan media pembelajaran interaktif berbantuan iSpring yang memenuhi kriteria valid dan praktis, guna mendukung self-regulated learning siswa dan membantu siswa kelas VIII SMP/MTs memahami materi bangun ruang sisi datar. Proses pengembangan dilakukan mengikuti model ADDIE. Subjek uji coba adalah siswa kelas VIII SMPN 20 Pekanbaru. Pengumpulan data dilakukan melalui wawancara dan angket, dengan instrumen

https://doi.org/10.30606/absis.v8i1.2661

berupa lembar validasi ahli, angket respons siswa, dan angket self-regulated learning. Hasil validasi menunjukkan bahwa media tergolong "sangat valid" dengan skor rata-rata 3,76. Pada uji coba kelompok kecil, skor respons siswa sebesar 0,92 dikategorikan "sangat praktis," dan skor self-regulated learning sebesar 77,51% termasuk dalam kategori "baik." Sementara itu, pada uji coba kelompok besar, skor respons siswa sebesar 0,81 dikategorikan "praktis," dan skor self-regulated learning sebesar 79,61% juga termasuk kategori "baik." Hasil tersebut menunjukkan bahwa media pembelajaran yang dikembangkan telah memenuhi kriteria valid dan praktis.

Kata-kata kunci: media pembelajaran interaktif, iSpring, self-regulated learning, bangun ruang sisi datar

INTRODUCTION

Mathematics is a subject that demands a high level of logic and reasoning. Therefore, students are expected to be creative, skilled, intelligent, and independent in their learning so they can apply the concepts they have learned (Nurfitriyanti, 2016). Self-directed learning is defined as the ability of students to willingly engage in learning on their own, without being forced by external parties (Bungsu et al., 2019). According to Egok (2016), self-directed learning refers to the effort to master particular material independently, based on intrinsic motivation. Thus, self-directed learning can be understood as both a skill and an effort undertaken by students to learn independently and with motivation, without external coercion.

Suhendri and Mardalena (2013) state that self-regulated learning is crucial for minimizing undesirable habits such as students being unable to study for extended periods, only studying before exams, being passive in class, cheating, and not participating in learning activities. Despite its importance, self-regulated learning is often underdeveloped because students still perceive the teacher as the sole source of knowledge. As a result, students become highly dependent on others, especially their teachers (Jumaisyaroh et al., 2014). One of the contributing factors to low self-regulated learning is students' reliance on teachers during the learning process, which limits their initiative to utilize various learning resources or take independent action (Azizah, 2018).

Interviews with an eighth-grade mathematics teacher at SMPN 40 Pekanbaru revealed that students were hesitant and lacked confidence when responding to questions. Many did not submit their assignments, and few took the initiative to answer questions unless called upon. Furthermore, students tended to depend on the teacher when encountering challenging mathematical problems. These observations indicate that students rely heavily on the teacher and perceive them as the only source of knowledge. Additionally, some students copied from peers, and enthusiasm for mathematics lessons was low. This suggests that self-regulated learning has not yet emerged during mathematics instruction.

Low levels of learning independence were also reported by Kurnia and Warmi (2019), who found that eighth-grade students in a private junior high school in Karawang

were not yet confident or responsible for mathematics assignments, as they were accustomed to copying the work of others. Similarly, Melissa (2016) observed that learning activities at SMP Negeri 15 Yogyakarta were still teacher-centered, with the teacher dominating classroom discourse. These findings reinforce the conclusion that students continue to rely on their teachers and have not yet developed independent learning habits.

To support the development of students' self-regulated learning, technological innovations are needed, particularly through the use of interactive learning media. Such media can capture students' attention, increase motivation, foster interaction with their learning environment, and enable students to learn independently according to their own interests and abilities (Cecep & Darmawan, 2020). According to Pujawan (in Novianti, 2018), the benefits of interactive learning media include enabling students to learn independently or in small groups according to their skill level, while also making the learning process more engaging and effective.

Interviews with a mathematics teacher at SMPN 20 Pekanbaru showed that instruction primarily relied on printed textbooks and student worksheets. Although the school is equipped with a computer lab and a projector, the teacher rarely incorporates multimedia into lessons. The primary media used is PowerPoint, projected while the teacher explains the material. This approach still positions the teacher as the central figure in the learning process.

To promote student independence, there is a need for learning media that students can operate autonomously, such as iSpring. Bauman (in Arlitya, 2017) states that media created with iSpring can be exported in formats such as Flash, PowerPoint, HTML5, and MP4, and can also be accessed offline via mobile devices. iSpring integrates with PowerPoint, making it accessible to students via Android devices even without an internet connection. Several studies have demonstrated the effectiveness of iSpring-based learning media, including the development of media for eighth-grade students (Ramadani et al., 2022) and interactive mathematics media for social arithmetic (Widyawati et al., 2022). These studies confirm the positive impact of iSpring on student learning. The present study differs in terms of the skill facilitated and the topic addressed—it focuses on supporting students' independent learning of flat-sided space shapes in the eighth grade.

Sari (2018) identifies flat-sided space shapes as one of the most challenging topics for junior high school students to master. This topic is part of the mathematics curriculum at the junior high level. Interviews with eighth-grade students at SMPN 20 Pekanbaru indicate that they find the topic difficult to understand and uninteresting, often resulting in a lack of engagement.

Based on the issues described, the purpose of this research is to develop interactive mathematics learning media using iSpring on the topic of flat-sided space shapes that students can use both inside and outside the classroom. The iSpring-assisted media is intended to deliver instructional content via laptop, computer, or Android

https://doi.org/10.30606/absis.v8i1.2661

device, allowing students to learn independently and offline, thereby fostering the development of self-regulated learning.

METHODS

This study employed Research and Development (R&D) methodology, with stages based on the ADDIE model: Analysis, Design, Development, Implementation, and Evaluation. The analysis stage involved three main activities: curriculum analysis, student analysis, and needs analysis. In the design stage, a plan for the learning media was created, including the organization of its structure by determining content sections, as well as selecting and collecting elements such as backgrounds, soundtracks, images, and animations.

The development stage consisted of a validation process conducted by three expert validators, ensuring the product met quality standards. Revisions were made based on the suggestions and input from these experts. The implementation stage referred to the trial phase of the validated product, which was tested with students in both small and large groups to assess whether the product achieved its development objectives. In addition, the evaluation stage involved reviewing and analyzing the product testing process to identify areas for improvement.

Table 1. ADDIE-Based Product Development Framework

Stage	Activities	Target
Analysis	• Student analysis • Needs analysis • Curriculum analysis	Analysis summary
Design	• Designing the content • Creating the media layout design • Selecting and collecting background, sound, images, and animations	Initial design
Development	• Validation • One-on-one evaluation • Validation data analysis • Revision of learning media	• Validation results • One-on-one evaluation results • Validation analysis data • Valid learning media
Implementation	• Small group trial • Large group trial • Trial data analysis • Revision of learning media	• Trial results • iSpring-assisted interactive learning media on flat-sided space shapes that is valid and practical
Evaluation	(Forwarded evaluation from the implementation stage)	

The research subjects consisted of six eighth-grade students from SMPN 20 Pekanbaru for the small group test, and 31 students for the large group test. Data collection was carried out through surveys and interviews. The instruments used in this study included three questionnaires: a validation questionnaire, a student response questionnaire, and a self-regulated learning questionnaire.

This study produced two types of data: quantitative data, obtained from the scores of validation assessments, student responses, and self-regulated learning questionnaires; and qualitative data, derived from interviews and feedback from both validators and students. The collected data were analyzed using techniques for validity analysis, practicality analysis, and self-regulated learning analysis.

FINDING AND DISCUSSION

The learning media developed based on the ADDIE model is explained in each of the following stages.

Analysis

In this stage, several analyses are conducted. Curriculum analysis is useful for obtaining information related to the implementation of the curriculum in schools. Based on the interview, it was found that the school implements the 2013 curriculum; however, the results of the observation of the learning process indicate that teachers tend to explain the material in front of the class and at the end, the teacher gives exercises from the LKS book. This is not in line with the demands of the 2013 curriculum, which requires student-centered learning, not teacher-centered. Learning with the 2013 curriculum expects students to be active so that competencies and learning objectives can be achieved (Kusumawati & Sumardi, 2016). From the interview, it was also revealed that students are less interested and consider the topic of flat-sided geometric shapes to be difficult. Therefore, it is necessary to develop interactive learning media that can present the material on flat-sided geometric shapes in a more engaging way.

The Basic Competencies (KD) for the topic of flat-sided space shapes are found in KD 3.9 (knowledge competency), which states "to differentiate and determine the surface area and volume of flat-sided space shapes (cube, rectangular prism, prism, and pyramid)," and KD 4.9 (skill competency), which states "to solve problems related to the surface area and volume of flat-sided space shapes (cube, rectangular prism, prism, and pyramid), as well as their combinations."

To achieve KD 3.9 and 4.9, it is necessary to design achievement indicators that students must meet. The results of the analysis of the KD produced the following Competency Achievement Indicators (IPK).

- 3.9.1 Determine the surface area of rectangular prisms and cubes
- 3.9.2 Determine the surface area of prisms and pyramids
- 3.9.3 Determine the volume of rectangular prisms and cubes
- 3.9.4 Determine the volume of prisms and pyramids

https://doi.org/10.30606/absis.v8i1.2661

- 4.9.1–4.9.4 Solve problems related to the surface area and volume of those shapes

Based on the KD and IPK, there are 4 subtopics, which include 1) surface area of rectangular prisms and cubes, 2) surface area of prisms and pyramids, 3) volume of rectangular prisms and cubes, and 4) volume of prisms and pyramids. Next is the student analysis, which serves to gather information regarding the background skills and knowledge of students by observing them during teaching and learning activities in the classroom. The result obtained is that teachers are still the center of learning. When the teacher explains the material, some students do not pay attention and do not ask questions if they do not understand what is being taught. After the teacher explained the learning material, the students were asked to complete practice questions, but they faced difficulties while doing so. Based on an interview with the eighth-grade teacher, it was found that the students lacked enthusiasm when learning mathematics, did not take the initiative to ask questions when they did not understand the material being taught, and were not responsible for the assignments or homework given. Thus, it is necessary to develop learning media that can facilitate student independence.

The final analysis is the needs analysis, where an analysis of the use of learning media in schools is conducted through interviews and observations regarding the issues that arise during the learning process. Here are the results of the needs analysis at SMPN 20 Pekanbaru.

1. Learning tends to rely on printed books from school and worksheets.
2. Teaching media have been used by teachers but are rarely applied due to time constraints, teachers' creativity, and knowledge about technological advancements.
3. Students are not yet independent and are not actively involved in using the learning media provided by the teacher.
4. Learning media are utilized by teachers, but they still explain the material, so students mostly just listen.
5. Students are tech-savvy and can access information from the internet.The school has a computer lab equipped with Wi-Fi and an Infocus projector.

Thus, a solution is needed to optimize the use of learning media that can stimulate students to be active and independent in their learning activities, by developing interactive learning media for flat-sided space materials that are student-centered.

Design

The purpose of the design stage is to plan learning media by selecting formats and creating an initial draft of the media. The activity in selecting the format involves creating an outline for 1) the initial page, which consists of the title of the material, class information, a button to start the learning media, and a button to exit the learning media; 2) the main menu, which displays 4 menu options: button instructions, KD & IPK, introduction, and material; 3) button instructions, which

contain the function of each button in the media; 4) KD and IPK, designed so that students understand the competencies and indicators that will be achieved after participating in the learning; 5) the introduction, which includes a display of images related to flat-sided geometric shapes. The next page will explain the connection between the images and the material; 6) the material has 4 sub-material options. After that, a preliminary design was created based on the established format.

Here are some examples of the design displays of the developed learning media.

Figure 1. Example of learning media design

Development

Validation of the learning media was conducted by 3 experts, with the following results.

Table 2. Summary of Validity Analysis

Aspect	Assessment Criteria for Media				Average	Category
	1	2	3	4		
Curricullum	4.00	4.00	4.00	4.00	4.00	Very Valid
Learning	3.89	3.78	3.89	3.89	3.86	Very Valid
Display	3.61	3.61	3.61	3.61	3.61	Very Valid
Program	3.52	3.62	3.57	3.57	3.57	Very Valid
Average	3.76	3.75	3.77	3.77	3.76	Very Valid

Based on the validation process, the average score obtained is 3.76, categorized as "very valid." This means it is suitable for testing the learning media. The results are in line with the validity criteria set by Suharsimi Arikunto (in Habibah et al., 2017),

https://doi.org/10.30606/absis.v8i1.2661

stating that a product is considered "valid" if it receives a minimum score of 2.5 and "very valid" if it receives a minimum score of 3.25.

The validation results consist of comments and suggestions from the validators regarding the learning media developed by the researcher, which include corrections for typographical errors and changing the icon of the button leading to the homepage from a three-line image to a house image to better represent the homepage (home).

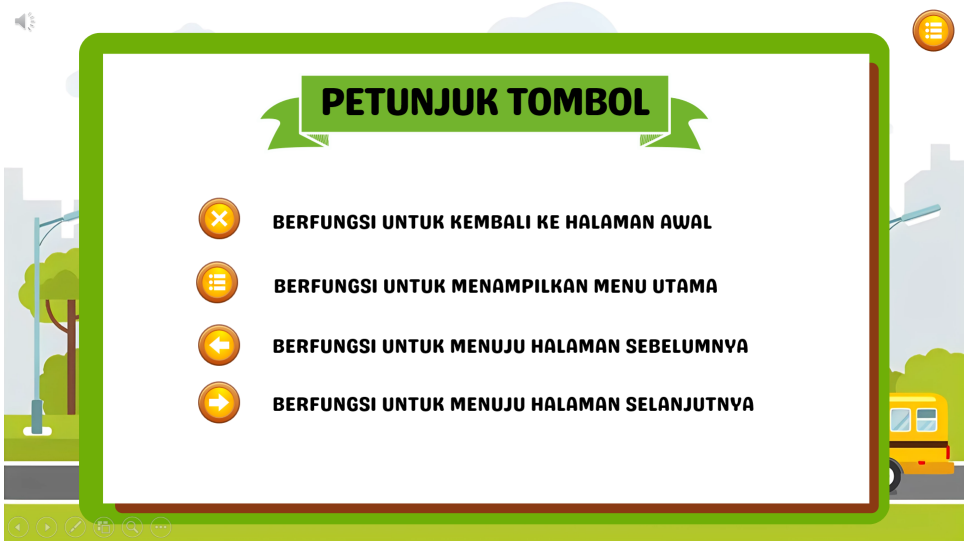

Figure 2. The appearance of the learning media before revision.

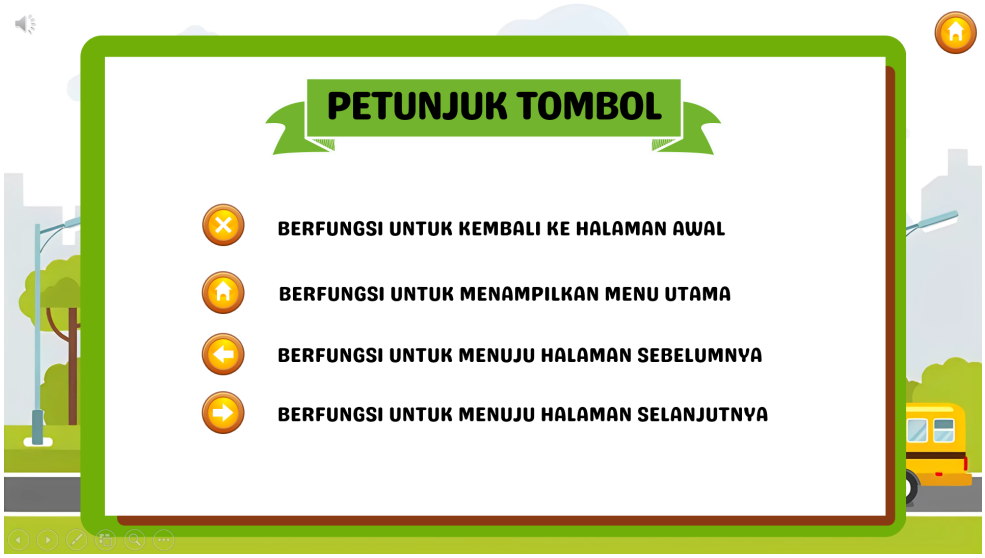

Figure 3. The appearance of the learning media after revision.

Along with the validation, a one-to-one evaluation was also conducted for three eighth-grade junior high school students by guiding them to use and study the learning media, and then asking for their opinions on the learning media that had been used. The students' responses indicate that the background display and color

selection in the media are good, making it visually appealing and capturing the students' attention. The language used is simple, making it easy to understand. The images in the learning media are engaging, which helps to make the learning process less boring, and the material is clear and easy to grasp. However, on the initial page of the learning media, students have difficulty understanding because there are no instructions on what to click or do. Then, on the main menu page (which contains button instructions, KD & IPK, introduction, and material), students are unclear about which menu to open first because there are no indications of which menu should be accessed initially. The improvement made based on student feedback is to create instructions or guidance on the initial page so that students know how to start using the learning media and direct them to open the menus on the main page. On the initial page, audio has been added to guide students to click the play now button to start using the media, and that button is made to blink so that students pay attention to it. Then, on the main page, audio has been added to direct students to open the instruction menu for buttons, KD & IPK, introduction, and materials in order.

Implementation and Evaluation

After the product has been validated and revised according to the feedback from validators and students, trials are conducted on both a small and large scale. A summary of the analysis of response questionnaires and self-regulated learning questionnaires from the small-scale trial is presented in Tables 3 and 4.

Table 3. Summary of Response Questionnaire Analysis in the Small Group

Aspect	Sub Material				Average	Category
	1	2	3	4		
Learning	0.97	0.97	0.97	0.97	0.97	Very Practical
Objective	0.78	0.78	0.83	0.89	0.82	Very Practical
Technical Quality	0.88	0.93	0.95	0.95	0.93	Very Practical
Average	0.88	0.89	0.92	0.94	0.91	Very Practical

Through Table 2, it is known that the aspect of objectives received the lowest score of 0.82, while the aspect of learning received the highest score of 0.97. The overall practicality rating of the media is 0.91, which is classified as very practical. This is in line with Suharsimi Arikunto (in Habibah et al., 2017) that learning media meets practical criteria if it scores at least 0.6 in the "practical" category or at least 0.8 in the "very practical" category. According to Syahmaidi & Hidayat (2016), practicality is a measure to assess the level of usability of a product. This means that the learning media is engaging, the content explanation is easy to understand, and it is user-friendly for students.

https://doi.org/10.30606/absis.v8i1.2661

Next, the student self-regulated learning questionnaire is processed and summarized in Table 4.

Table 4. Summary of Self-regulated learning Analysis in Small Groups

Indicator	Sub Material				Average	Category
	1	2	3	4		
Self-confidence	66,67%	69,79%	70,83%	73,96%	70,31%	Good
Responsibility	69,44%	75.00%	76,39%	76,39%	74,31%	Good
Initiative	75.00%	78,47%	78,47%	78,47%	77,60%	Good
Dicipline	83,33%	85,42%	85,42%	85,42%	84,90%	Very Good
Average					76,78%	Good

Based on the processing of the student self-regulated learning questionnaire results, it appears that the confidence indicator received the lowest average percentage at 70.31%, while the discipline indicator received the highest average percentage at 84.90%. The overall average for the media is 76.78%, indicating that the level of student self-regulated learning is categorized as good. This result aligns with the criteria for student self-regulated learning by Zamani & Nurcahyo (2016), which states that self-regulated learning is well-facilitated if the level of self-regulated learning reaches the "good" or "very good" category, with a minimum average of 60%.

Next, a trial will be conducted on a larger scale. Table 5 presents the results of the response questionnaire analysis in the large group trial.

Table 5. Summary of Response Questionnaire Analysis in the Large Group Trial

Aspect	Sub Material				Average	Category
	1	2	3	4		
Learning	0.88	0.88	0.93	0.58	0.94	Very Practical
Objective	0.76	0.80	0.77	0.71	0.81	Very Practical
Technical Quality	0.83	0.85	0.87	0.75	0.88	Very Practical
Average					0.88	Very Practical

Based on the processing of the student self-regulated learning questionnaire results, it appears that the confidence indicator received the lowest average percentage at 70.31%, while the discipline indicator received the highest average percentage at 84.90%. The overall average for the media is 76.78%, indicating that the level of student self-regulated learning is categorized as good. This result aligns with the criteria for student self-regulated learning by Zamani & Nurcahyo (2016), which states that self-regulated learning is well-facilitated if the level of self-

regulated learning reaches the "good" or "very good" category, with a minimum average of 60%.

Next, a trial will be conducted on a larger scale. Table 6 presents the results of the response questionnaire analysis in the large group trial.

Table 6. Summary of Response Questionnaire Analysis in the Large Group Trial

Indicator	Sub Material				Average	Category
	1	2	3	4		
Self-confidence	70.16%	72.38%	74.80%	75.20%	73.14%	Good
Responsibility	73.92%	75.81%	79.57%	79.84%	77.29%	Good
Initiative	74.19%	76.75%	78.23%	77.96%	76.78%	Good
Dicipline	92.34%	89.11%	90.73%	92.74%	91.23%	Very Good
Average					79.61%	Baik

Through Table 6, it is known that the confidence indicator received the lowest average at 73.14%, while the discipline indicator received the highest average at 91.83%. The average score of all indicators is 79.61%, indicating that students' self-regulated learning is classified as good. In line with the criteria for student self-regulated learning by Zamani & Nurcahyo (2016), self-regulated learning is well facilitated when the level of self-regulated learning reaches the "good" or "very good" category, with a minimum average of 60%. Thus, the learning media produced has met the valid and practical requirements.

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this study, it can be concluded that the final product developed is an interactive learning media assisted by iSpring, designed for eighth-grade junior high school and Madrasah Tsanawiyah students, specifically on the topic of flat-sided space shapes. The developed media is aimed at supporting students' independent learning, particularly in improving their self-regulated learning skills. The product has been validated through expert review and student trials, and it successfully meets the established criteria for both validity and practicality, falling into the categories of "very valid" and "very practical." This indicates that the media is suitable for use in the mathematics learning process and can serve as a tool to promote more student-centered and interactive instruction.

However, this study was limited to assessing the validity and practicality of the media, without testing its impact on student learning outcomes in depth. Therefore, it is recommended for future researchers to conduct further investigations regarding the effectiveness of iSpring-assisted learning media, particularly in enhancing learning achievement, motivation, and long-term retention. Additional studies can also explore its integration in various mathematical topics or in different

https://doi.org/10.30606/absis.v8i1.2661

educational settings, and assess its impact on diverse student characteristics, such as learning styles or digital literacy.

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