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## Needs Analysis of Interactive Infographic Learning Media Development on Ecosystem Balance Material for Elementary Schools

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### ABSTRACT

The development of interactive infographic learning media helps present learning material in a more visual and engaging way. The first step in this process is analyzing the needs of students and teachers. This study focused on six key aspects: pedagogical, technical, cognitive, aesthetic, socio-cultural, and evaluation aspects. The research took place during the odd semester at Khalifah Annizam Islamic Elementary School in Palembang, involving 16 fifth-grade students and three teachers. A descriptive quantitative method was used to understand the needs of learners, teachers, and learning media. Data was collected through questionnaires and analyzed using the Guttman scale. The results showed that the highest average percentage in the medium category was found in the pedagogical aspect (61%), technical aspect (55%), socio-cultural aspect (70.8%), and evaluation aspect (56%). Other aspects were in the high and low categories. These findings indicate the need to improve these aspects by developing interactive infographic learning media to support a more effective learning process.

## 1. Introduction

Learning is a system that has many interconnected components to achieve educational goals. The components of the learning system include learning objectives, learning materials, methods, strategies, learning media, and evaluation tools, therefore the success of learning objectives is determined by teachers who are able to connect the components of the learning system so as to create an atmosphere that encourages students to learn (Wang et al., 2023). A quality learning system is based on how teachers and students, as well as each component of the learning device interact with each other to support the success of learning (Sanjaya, 2015). Therefore, it is very important for teachers to build interactions in learning to get quality learning outcomes.

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Planning how to deliver a lesson needs to be tailored to the needs of students, so the use of learning media is a tool that makes it easier for teachers to convey material to students so that students are motivated to take part in learning. Learning media designed according to the needs of students can create optimal understanding for students. Sapriyah (2019) said that the media in the teaching and learning process is very important and has an impact on the activeness of students during the learning process, experience, and understanding which can improve student achievement. Therefore, the existence of learning media in teaching and learning activities is needed so that learning objectives can be achieved effectively and efficiently, especially in the use of digital-based learning media.

The development of education in the digital realm has a positive effect on the interaction between teachers and students because the utilization of information technology creates more meaningful learning that can adjust the learning needs of students. One of the digital media that can accommodate the needs and learning styles of students in the form of text, sound, and images is interactive infographic learning media. The concept of infographic learning media provides structured text and is able to visualize information, data or reading text material in an easy-to-read presentation form with a visual display so that the delivery of material becomes easier to understand (Padrian et al., 2020).

Infographics can also present complex text explanations to be simpler through visual language that has an interactive and meaningful explanation according to the teaching material (Sultan Al Fasya et al., 2022). Based on the results of previous research conducted by Azizah & Susanti (2023) states that students show more need for interesting learning media, through images, text, and brief explanations that can be easily understood. Supported by the results of research by Hasyim et al. (2023) outlines that there are implications for the use of infographic media in learning in elementary schools, namely that it can improve student learning outcomes, increase positive attitudes towards learning. Based on the results of this study, it shows good effectiveness with the use of infographic learning media.

However, in reality, the main difficulty experienced by teachers in developing media is limited skills, namely the lack of understanding of developing digital-based interactive media. According to Sinaga (2024) another challenge is understanding learners' preferences and needs for appropriate learning media. Often, learning media developed are not aligned with learning styles so that they do not accommodate the abilities of heterogeneous learners. Because of these problems, initial research is needed with a needs analysis step towards the development of interactive infographic learning media, which will be developed so as to provide an overview of information to researchers and teachers to find out, analyze, and ensure that the media developed is in accordance with the needs of students, teachers and the elementary school environment (Dewi et al., 2021; Hikmah & Hayudinna, 2022). With the hope that it can support more effective learning according to the learning objectives to be achieved.

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This research aims as an initial study, namely a needs analysis to collect information in order to analyze the needs of developing interactive infographic learning media that is suitable for students and the learning process at Khalifah Annizam Islamic Elementary School Palembang. The main purpose of this research is to analyze the needs of learners and teachers related to interactive infographic learning media that will be developed by researchers. The results of the initial needs analysis study are accurate and relevant information regarding the needs of infographic learning media for learning at Khalifah Annizam Islamic Primary School Palembang.

## 2. Methodology

The research method used in this needs analysis research is descriptive quantitative. This method aims to provide an in-depth understanding of the needs of learners, teachers, learning media, and instructions for infographic learning media that will be developed and support the learning process at Khalifah Annizam Islamic Elementary School Palembang. The sampling technique uses a questionnaire, then scoring using a Guttman scale, namely the yes statement is given a score of 1 and the answer to the statement is not given a score of 0. The data from the needs analysis questionnaire is calculated quantitatively to get clear results and conclusions regarding the percentage comparison of each aspect of need consisting of pedagogical, technical, cognitive, evaluation, socio-cultural, and evaluation aspects, then the data the needs of each aspect will be used to develop the right interactive infographic learning media according to the needs of students and teachers (Raharjo et al., 2023). This method helps present data in the form of numbers so that the results of the needs analysis can be more clearly measured and more objective. Table 1 shows the grids for each aspect of the needs analysis of students, teachers, learning media, and learning objectives:

Table 1. Learner Needs Analysis Grid

No.	Aspects	Indicator	Question Number
<b>I</b>	<b>Pedagogical</b>	a. Understanding	1, 2, 3
		b. Learning Method (Learning style)	4, 5, 6
		c. Learning Process	7, 8, 9
<b>II</b>	<b>Technical</b>	a. Accessibility	10, 11, 12
		b. Skills	13, 14, 15
<b>III</b>	<b>Cognitive</b>	a. Ability to Absorb Information	16, 17, 18
		b. Material Comprehension	19, 20, 21
<b>IV</b>	<b>Aesthetics</b>	a. Preferences	22, 23, 24
		b. Visual Appearance and Aesthetics	25, 26, 27
<b>V</b>	<b>Social Culture</b>	a. Relevance	28, 29, 30
		b. Social and Cultural Values	31, 32, 33
<b>VI</b>	<b>Evaluation</b>	a. Measurement of Level of Understanding	34, 35, 36
		b. Feedback	37, 38, 39

To understand the needs of appropriate learning media for students, an analysis was conducted to identify aspects that support learning effectiveness. The results of the analysis are presented in Table 2 below, which contains a mapping of learning media needs based on student characteristics and preferences.

Table 2. Learning Media Needs Analysis Grid for Students

No.	Aspects	Indicator	Question Number
<b>I</b>	<b>Pedagogical</b>	a. Appropriateness of Media Content	1, 2, 3
		b. Media Capabilities	4, 5, 6
<b>II</b>	<b>Technical</b>	a. Media Formats and Technologies	7, 8, 9
		b. Practicality of Media	10, 11, 12
<b>III</b>	<b>Cognitive</b>	a. Media Capabilities	13, 14, 15
		b. Visual Elements	16, 17, 18
		c. Understanding	19, 20, 21
<b>IV</b>	<b>Aesthetics</b>	a. Visual Media Design	22, 23, 24
		b. Suitability of Visual Elements	25, 26, 27
<b>V</b>	<b>Social Culture</b>	a. Design and Content Integration	28, 29, 30
		b. Diversity	31, 32, 33
<b>VI</b>	<b>Evaluation</b>	a. Provision of Evaluation Tools	34, 35, 36
		b. Media Capabilities	37, 38, 39

To obtain a more comprehensive picture of teachers' needs in supporting the learning process, various aspects related to the use of media, methods and learning resources were analyzed. The results of this analysis are presented in Table 3 below, which summarizes the needs of teachers in improving learning effectiveness.

Table 3. Teacher Needs Analysis Grid

No.	Aspects	Indicator	Question Number
<b>I</b>	<b>Pedagogical</b>	a. Training	1, 2
		b. Teaching Methods	3, 4
<b>II</b>	<b>Technical</b>	a. Infrastructure	5, 6
		b. Affordability	7, 8
<b>III</b>	<b>Cognitive</b>	a. Ability	9, 10
		b. Understanding	11, 12
<b>IV</b>	<b>Aesthetics</b>	a. Design	13, 14
		b. Compatibility	15, 16
<b>V</b>	<b>Social Culture</b>	a. Integration	17, 18
		b. Representation of Diversity	19, 20
<b>VI</b>	<b>Evaluation</b>	a. Internal Evaluation Tool	21, 22
		b. Reports and Data	23, 24

To formulate learning objectives that are in line with the needs of students and the curriculum, various aspects that support the achievement of competencies are analyzed. The results of this analysis are presented in Table 4 below, which contains a mapping of needs in the formulation of learning objectives.

Table 4 Learning Objectives Needs Analysis Grid

No.	Aspects	Indicator	Question Number
<b>I</b>	<b>Pedagogical</b>	a. Conformity with Learning Outcomes	1, 2,
		b. Learning Taxonomy Level Ability	3, 4
<b>II</b>	<b>Technical</b>	a. Availability of Tools and Technology	5, 6
		b. Media Integration	7, 8
<b>III</b>	<b>Cognitive</b>	a. Critical and Analytical Thinking Skills	9, 10
		b. Clarify the Concept	11, 12
<b>IV</b>	<b>Aesthetics</b>	a. Visual Aesthetics	13, 14
		b. Attractiveness	15, 16
<b>V</b>	<b>Social Culture</b>	a. Socio-cultural Context Relevance	17, 18
		b. Local Values and Culture	19, 20
<b>VI</b>	<b>Evaluation</b>	a. Measurement Tools	21, 22
		b. Achievement Indicator	23, 24

In an effort to understand teachers' needs related to the use of learning media, an in-depth analysis of various aspects that support teaching effectiveness was conducted. The results of this analysis are presented in Table 5 below, which contains a mapping of teachers' needs in utilizing learning media.

Table 5. Lattice of Teacher Needs Analysis of Media

No.	Aspects	Indicator	Question Number
<b>I</b>	<b>Pedagogical</b>	a. Appropriateness of Media Content	1, 2,
		b. Media Capability	3, 4
<b>II</b>	<b>Technical</b>	a. Media Formats and Technologies	5, 6
		b. Practicality of Media	7, 8
<b>III</b>	<b>Cognitive</b>	a. Media Capabilities	9, 10
		b. Visual Elements	11, 12
<b>IV</b>	<b>Aesthetics</b>	a. Visual Media Design	13, 14
		b. Suitability of Visual Elements	15,
<b>V</b>	<b>Social Culture</b>	a. Design and Content Integration	17, 18
		b. Diversity	19, 20
<b>VI</b>	<b>Evaluation</b>	a. Provision of Evaluation Tools	21, 22
		b. Media Capabilities	23, 24

This needs analysis was carried out in the odd semester of the 2024/2025 school year with research subjects totaling 16 students (8 boys and 8 girls) in class V and 3 class teachers at Khalifah Annizam Islamic Elementary School Palembang.

### 3. Result and Discussion

The needs analysis of this research was carried out through distributing questionnaires to students and teachers consisting of questionnaires analyzing the

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needs of students, media needs of students, teacher needs, media needs for teachers, and instructional analysis. This needs analysis is an effort of educators in planning learning activities that support interaction between students and teachers in an educative manner so that it can facilitate learning objectives to be achieved optimally, therefore educators need to analyze the aspects that underlie learning activities. The aspects that are important success factors are pedagogical, technical, cognitive, aesthetic, socio-cultural, and evaluation aspects.

Pedagogical aspects are knowledge is indispensable as professional capital to be able to manage optimal learning for teachers and students. According to Ayyubi et al. (2024) pedagogical competence is an understanding of the educational foundation, starting from understanding the characteristics, morals, and intellectuals of students, curriculum development, learning planning, implementing education, evaluating learning outcomes, and developing students to actualize their various potentials as explained by Kumala et al. (2018) , pedagogical aspects are processes and activities with the aim of understanding the characteristics of students in the learning process, thus analyzing needs in pedagogical aspects has a major role in designing appropriate media and supporting learning activities.

The technician aspect plays an important role in supporting the learning process. This skill is very necessary in today's modern era because the use of aids as a means of delivering learning can be done more interestingly and efficiently. In the current era, the application of technology in learning media is a necessity that cannot be ignored because it helps students receive subject matter (Hikmah & Hayudinna, 2022). When applying technology-based media, technical aspects are taken into consideration, therefore analyzing technical capabilities is very useful for understanding the readiness of the learning process. Technical aspects can be interpreted as methods used in delivering communication in learning prepared by educators (Fitriana, 2019). The use of technology in learning can provide a variety of delivery of subject matter for students, therefore technical aspects are very important in analyzing learning readiness including the use of learning media (Eprilia et al., 2023).

The cognitive aspect is the main component that needs to be considered in developing learning media because this aspect affects various abilities, namely knowledge, understanding, application, analysis, synthesis, and evaluation (Humairah et al., 2024). Quoted from Pramita (2023) cognitive aspects affect the way learners understand concepts, apply knowledge, think critically, process information, solve problems to start developing higher order thinking skills. Therefore, the development of learning media needs to focus on the needs of cognitive aspects with the aim that students are able to receive learning easily.

The aspect that plays a role in developing a learning media so that it becomes more attractive is the aesthetic aspect. The word aesthetics is always associated with art that contains beauty by Sitti Hasnidar (2019) thus in developing a learning media this aspect becomes very necessary and attracts students. In line with the quote Falah (2019) which states that an educational environment that is

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in accordance with the psychology of students creates conducive learning, while creative arrangements increase their motivation and optimal development. So the aesthetic aspect has an influence in the development of an infographic learning media because it is the basis that ensures visual appeal in a learning media design.

In addition to aesthetic aspects, there are socio-cultural aspects that are no less important in the development of learning media because the need for socio-cultural value aspects needs to be integrated in learning that builds character and helps students understand cultural identity Prihartini (2018) emphasizes that learning media with socio-cultural values will make learning closer to experience because it is in accordance with real life, therefore socio-cultural aspects are a concern in media development so that values and norms are maintained and passed on to the next generation.

The crucial aspect that serves to assess the extent to which the educational objectives planned by the teacher have been achieved is the evaluation aspect. This aspect emphasizes on assessing the effectiveness of teaching media and methods as well as students' understanding of the material. Apart from being a measuring tool for learning achievement, evaluation is also a feedback for educators to improve the quality of learning (Miftha Huljannah, 2021). So the evaluation aspect needs to be analyzed as an assessment tool to determine the achievement and feedback of effective learning, therefore before developing the media it is necessary to analyze this aspect properly.

Table 6. Needs Analysis Results

Aspects	Category	Percentage Result of Needs Analysis Questionnaire					Average
		Learners	Media Learners	Teacher	Media Teacher	Instructional	
Pedagogical	High	19%	6%	33%	0%	100%	31,4%
	Medium	69%	69%	67%	100%	0%	61%
	Lo	13%	25%	0%	0%	0%	7,6%
Technical	High	19%	13%	0%	0%	0%	7%
	Medium	56%	50%	33%	67%	67%	55%
	Lo	19%	38%	67%	33%	33%	38%
Cognitive	High	31%	19%	100%	100%	0%	50%
	Medium	69%	63%	0%	0%	100%	46%
	Lo	0%	19%	0%	0%	0%	4%
Aesthetics	High	19%	6%	67%	0%	0%	18,4%
	Medium	31%	75%	33%	33%	0%	34,4%
	Lo	50%	19%	0%	67%	100%	47,2%
Social Culture	High	20%	19%	0%	0%	33%	15,4%
	Medium	36%	56%	100%	100%	67%	70,8%
	Lo	44%	25%	0%	0%	0%	13,8%
Evaluation	High	13%	38%	0%	0%	33%	16,8%
	Medium	63%	50%	100%	67%	0%	56%
	Lo	25%	13%	0%	33%	67%	27,2%

Based on the consideration of the needs in developing interactive infographic learning media, the six aspects that have been discussed become a strong foundation to assist researchers in understanding the needs of learning media so as

to produce valid, effective, and efficient products. This needs analysis research involved 16 fifth grade students and three class teachers at Khalifah Annizam Islamic Elementary School Palembang. Needs analysis research aims to identify gaps between existing conditions and expected conditions. The goal is to focus on appropriate improvement efforts through appropriate learning media needs. Table 6 are the results of the needs analysis from the pedagogical, technical, cognitive, aesthetic, socio-cultural, and evaluation aspects written in percentage numbers.

In the context of education, needs analysis helps in designing learning, especially learning media. The emphasis on needs analysis can ensure the suitability of development to the needs of students (Rachmat Rizaldi & Syahlan, 2020). The needs analysis questionnaire is divided into five namely learner needs analysis, media needs analysis for students, teacher needs analysis, media needs analysis for teachers, and instructional needs analysis. Figure 1 below presents the pedagogical aspects that form the basis for designing and implementing learning. This aspect includes various elements that support an effective learning process that meets students' needs.

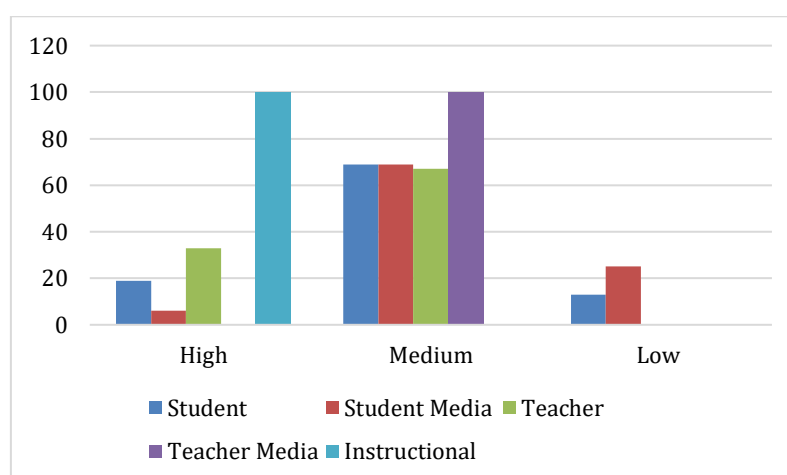


Figure 1. Pedagogical Aspects

The results of the first needs analysis, namely in the pedagogical aspect, if analyzed the diagram above shows the majority of the highest scores are in the medium category with the acquisition of percentages on the needs of students, namely (69%), the needs of students for media (69%), the needs of teachers (67%), and finally for the needs of teachers for media (100%). Furthermore, the high category is obtained in instructional needs with a percentage of (100%). So for the overall category for pedagogical aspects, the highest average percentage results are in the medium category with a percentage of (61%), this shows that the understanding and application of this aspect in learning is good enough but the challenge in this pedagogical aspect lies in optimizing the use of learning media for students according to their needs, supported by research Manggala et al.(2023) in his research wrote that developing learning media according to needs can help facilitate students in terms of understanding material and focus. Therefore infogafis learning media can be a variety of learning media that can improve



learning outcomes Hasyim et al.(2023) confirms the existence of infographic media shows positive results on learning motivation, attitudes, and learning outcomes. Figure 2 below shows the technical aspects that play a role in supporting the implementation of learning media.

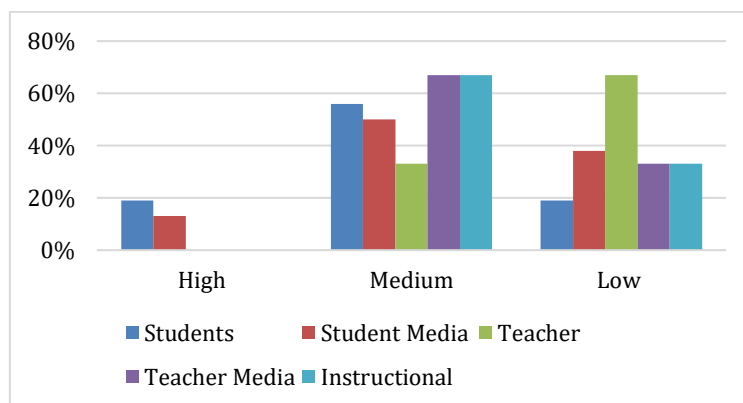


Figure 2. Technical Aspects

In the second aspect, namely technical, through the percentage value on the diagram shows the most dominant value is in the medium category. In the needs of students get a percentage (56%), for the needs of students for media by (50%), the needs of teachers (33%), the needs of media teachers get a value (67%), and finally the instructional needs of teachers get a value (67%). So overall from the calculation of the highest average value for this technical aspect is in the medium category with a percentage of (55%). This shows that in general, the technical aspects of learning have gone quite well, some students and teachers have an understanding of the technical aspects, especially the use of infrastructure, but still need to be improved to be more optimal when the implementation is carried out.

Furthermore, when observing the percentage results for teacher needs with a medium category percentage value, namely (33%) which means that attention needs to be paid to the needs of technician skills for teachers. Factors that can hinder learning are the teacher's ability to provide learning tools, especially media in facilitating the delivery of material (Wulandari et al., 2023). In line with research Sultan Al Fasya et al.(2022) wrote that the benefits of teachers' technical skills are that they can develop learning according to needs as a problem solution. Based on this, learning achievement is obtained when teachers use creative and varied learning media. Figure 3 below presents the cognitive aspects that play a role in supporting the development of students' understanding and thinking skills.

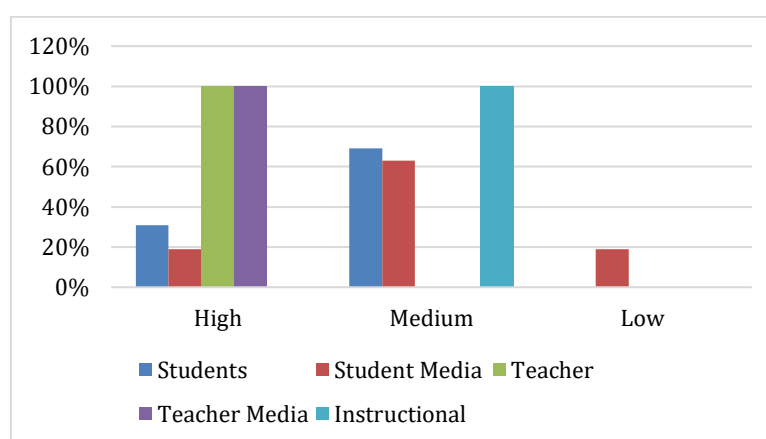


Figure 3. Cognitive Aspects

The next aspect is the cognitive aspect. In accordance with the percentage results in this aspect, the majority of the **highest percentage** values are in the **high** category, namely for the needs of teachers and learning media obtaining (100%). The medium category consists of a questionnaire of learners' needs, namely (69%), the needs of students in the media with a percentage of (63%), as well as in the instructional needs questionnaire with a percentage of (100%). This shows that most students have fairly good cognitive abilities, this indicates that the effectiveness of learning media for students still needs to be improved in order to better support the development of cognitive aspects optimally.

Meanwhile, on **teacher needs and teacher needs**, all of them are in the **high** category (100%). **Based on the overall results, the highest average value for cognitive aspects is in the high category, namely (50%)**, this reflects that teachers already have very good cognitive readiness, teachers have mastered the material that supports the teaching process. In contrast to the results of the needs of students who are still in the medium category, optimizing instructional strategies and using more innovative media are things that need to be considered to improve the quality of learning.

Media can create a more dynamic learning atmosphere, make the atmosphere more comfortable so that the learning environment becomes more collaborative and interactive, this condition can support students' understanding of material (Penelitian et al., 2024). Therefore, the use of interactive infographic learning media can affect the effectiveness of the learning plan prepared by the teacher. Figure 4 below shows the aesthetic aspects that play a role in increasing the attractiveness and effectiveness of learning media.

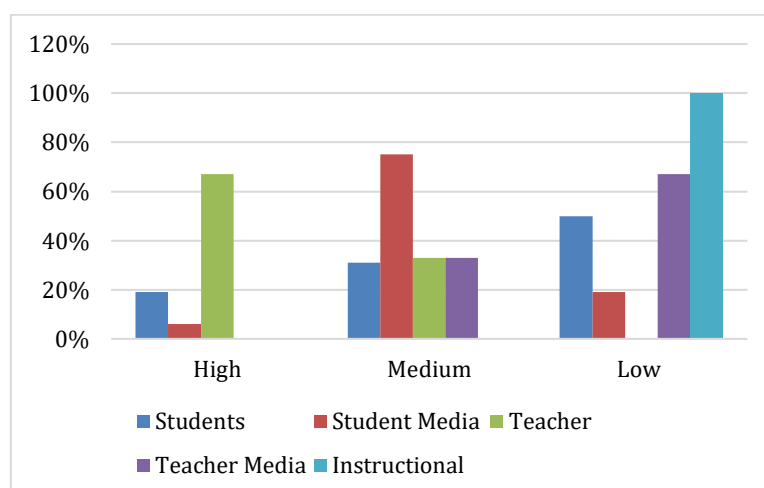


Figure 4. Aesthetic Aspects

The diagram above shows the results of the needs analysis for the aesthetic aspect, the percentage of teacher needs is in the high category, namely (67%), then the results of other calculations for analyzing the needs of students for the media are in the medium category, namely (75%), this shows that the aesthetic aspects of the media are very concerned by students. Furthermore, the results of the questionnaire of students' needs, teachers' needs for media and instructional needs with the highest percentage in this aspect are in the low category, namely (47.2%). Based on the need to use learning media with an attractive appearance more with a blend of visual and audio that supports the learning process.

Kustandi & Darmawan (2020) describes the attentional function of using infographic visual learning media, namely focusing the concentration of students, creating a pleasant learning atmosphere with the use of illustrated text and increasing students' understanding of the topics taught and helping to convey material messages to struggling students. Aesthetics in visual media has the potential to be the right way that facilitates the delivery of material information (Dunlap & Lowenthal, 2016). Based on these benefits, it is necessary to develop more aesthetic learning media so that it can increase the attractiveness of the learning process and learning motivation for students. Figure 5 below presents the socio-cultural aspects that play a role in shaping contextualized and relevant learning experiences for students.

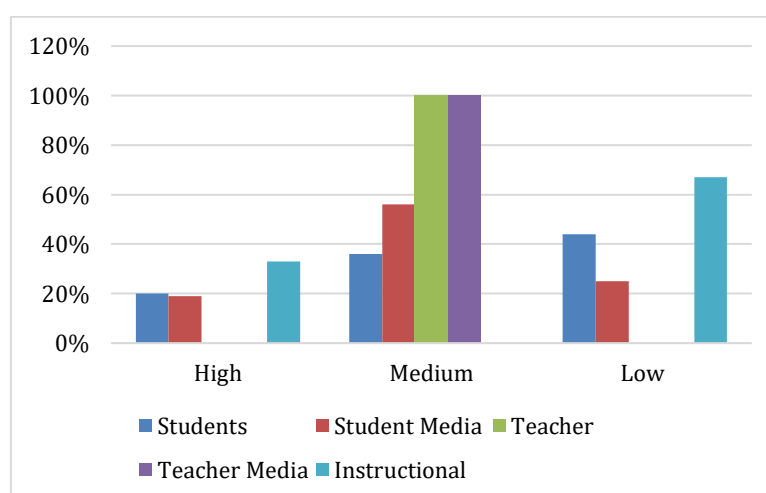


Figure 5. Socio-cultural Aspects

In accordance with the diagram above shows the results of the needs analysis for socio-cultural aspects, namely the majority of are in the moderate category consisting of a questionnaire analyzing the needs of students for media for students (56%), analyzing teacher needs and analyzing teacher needs for media getting a percentage (100%) and finally for instructional needs analysis getting (67%) for the moderate category.

So through this data it is known that this aspect has the highest percentage in the medium category, namely (70.8%) through this data it illustrates that the application of socio-cultural aspects in learning has been implemented and is going well, but in the questionnaire for analyzing the needs of students has a minimum percentage (20%) which means that socio-cultural aspects still need to be instilled in students. The socio-cultural context is the main role in the learning process that instills cultural values and character because education is a process of shaping human quality according to nature (Fuad Guntara I Nyoman Ruja, 2009).

Learning with socio-cultural aspects can be done with a variety of familiarization, delivery and assignments, and learning activities, therefore according to Mursidin et al.(2022) the development of knowledge and technology is not an obstacle for students but on the contrary can strengthen the cultivation of socio-cultural aspects itself one way with the right media planning as a tool for delivering material. The development of interactive infographic learning media can be a tool that supports students' understanding of socio-cultural aspects in Indonesia. Figure 6 below shows the evaluation aspects that play a role in measuring the effectiveness of learning and the achievement of student competencies.

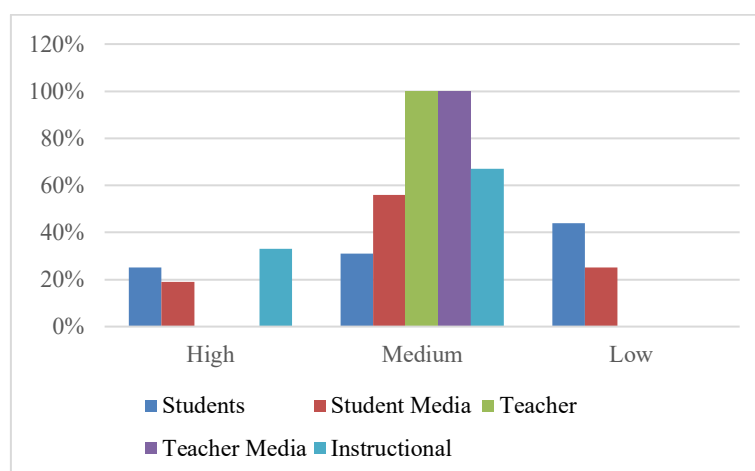


Figure 6. Evaluation Aspect

The last aspect is evaluation as in the diagram above shows the highest percentage is in the medium category. The description in the learner needs questionnaire obtained a percentage value (63%), for the questionnaire analyzing the needs of students for the media obtained a percentage (50%), then the teacher needs questionnaire obtained (100%), the percentage of the results of the teacher needs analysis questionnaire for the media was (67%) and on the other hand the instructional needs questionnaire only got a percentage (0%) in the moderate category. So the results of the triangulation of the highest average value in this aspect are in the moderate category with a percentage value of (56%). These results indicate that although the teacher's understanding of evaluation is good, the application of evaluation in learning media still needs attention through the development of innovative learning media. In previous research conducted by Dewi et al.(2021) that infographic media is very effective, this media makes it easier for students when carrying out independent learning activities that improve evaluation results through *pre-test and post-test* activities.

Based on the research data, the overall percentage results of the needs analysis questionnaire at Khalifah Annizam Islamic Elementary School, the highest is in the medium category which consists of pedagogical aspects with a percentage value (61%), technical aspects with a percentage value (55%), socio-cultural aspects with a percentage value (70.8%), and evaluation with a percentage value (56%), for other aspects are in the high and low categories . Based on this data, it became the initial basis for researchers in developing interactive infographic learning media that adjusted the needs of students and teachers by paying attention to pedagogical, technical, cognitive, aesthetic, socio-cultural, and evaluation aspects. Afriani et al. (2022) said the benefits of implementing learning media are to make the process run effectively, efficiently, and affect the level of interaction between teachers and students which can stimulate students' activeness and experience. So that learning is more optimal, according to researchers, strengthening development in technical and aesthetic aspects is needed so that the use of infographic media can improve the quality of learning in a more attractive, efficient and effective (Grasia et al., 2023; Ismaeel & Al Mulhim, 2021).

#### 4. Conclusion

Based on the results of the needs analysis, this research confirms that the six main aspects-pedagogical, technical, cognitive, aesthetic, socio-cultural and evaluation-have varying levels of achievement in learning. In general, most aspects have been implemented quite well, although there is still room for further development to improve the quality of learning. The results of this study also underline the importance of innovation in the development of learning media, especially interactive infographic media that are more aesthetically pleasing and in accordance with the needs of students and teachers. With the optimization of more innovative and adaptive learning media, it is expected that the effectiveness of learning can increase significantly and be able to support the achievement of educational goals to the fullest.

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