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Needs Analysis of Interactive Infographic Media Development with Vehicle-Themed Project Based Learning Model for Kindergarten B Children

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ABSTRACT

Early Childhood Education (ECED) plays a vital role in shaping children's cognitive, social, and motor development. However, implementing innovative learning methods remains a significant challenge. This study analyzes the need for developing interactive infographic media based on the Project-Based Learning (PjBL) model on the theme of vehicles for kindergarten B children. The research responds to children's low understanding of the theme, using a quantitative descriptive method with data collected via Guttman scale questionnaires involving 10 students and 2 teachers at Adventure Islamic Kindergarten Palembang. Findings show that the children's understanding level of the vehicle theme averaged 1.3, indicating a high need for more engaging and communicative media. Teachers also indicated a high level of need, with an average score of 1.5, emphasizing the importance of media aligned with the PjBL approach. The results conclude that developing interactive infographic media has strong potential to enhance children's conceptual understanding, boost learning motivation, and encourage active participation in thematic project-based learning in a fun and effective manner.

1. Introduction

Early Childhood Education (ECED) plays a central role in shaping the foundation of holistic child development which includes cognitive, affective, social-emotional, and psychomotor aspects (Latief, 2020; Novitasari et al., 2019). Early childhood is a golden age period that is critical and cannot be repeated, so the quality of stimulation provided in this phase will determine the long-term development of the child (Aeni & Setiasih, 2024). In this context, the learning process in PAUD institutions must be designed in such a way as to be able to stimulate children's potential optimally through an approach that is in accordance with the

characteristics of early childhood development which tends to be explorative, visual, and concrete (Uyun & Diana, 2023).

However, the reality on the ground still shows that there are challenges in the implementation of innovative and meaningful learning in the PAUD environment, especially in the utilization of interactive and technology-based learning media (Ardiana, 2022). Most learning processes in kindergartens are still dominated by conventional teacher-centered approaches, as well as the limited use of visual media that are interesting and appropriate to children's learning needs. This has an impact on the low active involvement of children in the learning process and the lack of understanding of the thematic concepts taught, including the theme of vehicles which is part of the PAUD curriculum (Uyun & Diana, 2023).

The vehicle theme is one of the important themes in early childhood thematic learning because it is directly related to the surrounding environment and the real world that is familiar with children's daily lives. Understanding this theme not only includes the introduction of the types of vehicles and their functions, but also develops classification, observation, and language skills and logical thinking. Therefore, a learning media is needed that is able to visualize the material in an interesting, contextual, and interactive way so that children can understand concepts in a fun and meaningful way (Eprilia et al., 2023; Fauziah et al., 2023; Ismaeel & Al Mulhim, 2021; Utomo, 2023). One relevant alternative is the development of interactive infographic media that combines visual elements, audio, and children's explorative activities (Permatasari et al., 2022).

Interactive infographic media is an innovative form of visual representation of information combined with interactive elements, such as animation, selection buttons, and sound (Nasution & Diansyah, 2020). This media is proven to increase children's learning engagement, accelerate information comprehension, and support early childhood learning styles that are more visual and kinesthetic. Several previous studies have shown that the use of infographic media in children's learning can increase children's interest, concept understanding, and encourage active participation (Ardiansyah et al., 2021; Ismaeel & Al Mulhim, 2021; Putri & Ana, 2024). However, most of the media developed are still passive and have not integrated a project-based learning approach that emphasizes children's involvement in the knowledge construction process directly through contextual activities.

This is where the integration of the Project-Based Learning (PjBL) learning model is important in the development of interactive infographic media. PjBL is a learning model oriented towards active student involvement in a project designed to solve real problems or answer open questions (Agustina, 2021; Hasni & Amanda, 2022). This model is very relevant to be applied to early childhood learning because it can accommodate children's exploration, collaboration, and reflection processes through concrete and fun activities. In addition, PjBL also supports the development of 21st century skills (4C: critical thinking, communication, collaboration, and creativity) from an early age, which is very important in preparing adaptive and innovative future generations (Windayana, 2018).

In this context, the need for the development of interactive infographic media integrated with the PjBL model becomes very urgent. However, based on the literature review and the state of the art of existing research, it is found that most studies still focus on using ordinary visual media or project-based learning separately, without combining the two synergistically. For example, a study by Permatasari et al. (2022) developed interactive infographic media but did not link it with the project approach. Meanwhile, a study by Irayana & Assyauqi (2024) shows the effectiveness of the PjBL model in early childhood thematic learning, but the media used are still manual worksheets that are less visually and digitally appealing.

The development of learning media that integrates interactive visual technology (infographics) with a project-based pedagogical approach (Project-Based Learning) is one of the potentials that can be done to answer various challenges in early childhood education learning, especially on the theme of vehicles for kindergarten B children (Utomo, 2023). The combination of these two approaches is considered to have great potential to increase children's learning engagement, concept understanding, and encourage meaningful child-centered learning. This research is important because it uses a needs analysis approach that involves direct perceptions from teachers and students, so that media development will be based on real conditions in the field, not mere theoretical assumptions. In addition, the research location at Adventure Palembang Islamic Kindergarten provides a local contribution in the context of digital media implementation in Islamic-based schools which is still minimally explored in similar studies (Latief, 2020).

The results of the needs analysis in this study are expected to be one of the reinforcements developing interactive learning media. The development of interactive infographic media based on PjBL is not only a solution to improve the quality of thematic learning, but also supports digital transformation in early childhood education gradually and purposefully (Firdaus & Prasetyo, 2025). Thus, this research is not only applicable, but also contributes to expanding the theoretical horizon and practice of technology-based ECD education and constructivistic approaches.

Overall, the background of this research underlines the importance of learning innovations that combine interactive visual aspects and a project-based approach in supporting early childhood learning. With a systematic and needs-based approach, it is expected that the results of this research can make a significant contribution to the development of PAUD learning media that is more creative, relevant, and has a direct impact on improving the quality of children's learning processes and outcomes, especially on the theme of vehicles in Kindergarten B.

2. Methodology

This research uses a quantitative descriptive approach, which aims to describe objectively and systematically the actual conditions related to the learning needs of kindergarten B children and the learning needs of kindergarten B teachers in the

context of developing interactive infographic learning media based on Project Based Learning (PjBL) on the theme of vehicles (Darwin et al., 2020). This approach was chosen because it is suitable for obtaining empirical data through numerical measurements that can be explained statistically. The subjects in this study involved 10 kindergarten B children and 2 classroom teachers from Adventure Palembang Islamic Kindergarten, who were selected through purposive sampling technique with the consideration that these participants had direct involvement in learning activities on the theme of vehicles, and had experience in using and assessing the effectiveness of available learning media.

The data collection technique was carried out through a closed questionnaire instrument prepared based on the Guttman scale, which is a dichotomous scale with two answer options, namely "Yes" and "No", designed to directly measure the level of need for learning media development (Widodo, 2019). The questionnaire was given in two forms: for children, the questionnaire was presented visually and assisted by teachers and researchers in the filling process to suit the cognitive abilities of early childhood; while for teachers, the questionnaire was designed to explore their perceptions and experiences related to the effectiveness of the media used and the readiness of the application of the PjBL model in teaching and learning activities. All items in the questionnaire were developed based on indicators of learning and learning needs, and have been validated by experts in the field of PAUD and media development.

The data obtained was analyzed descriptively quantitatively by calculating the frequency and percentage of each response, which was then averaged to determine the category of need level. The analyzed scores were classified into high, medium, and low categories to provide a more structured and focused description of the needs. The procedure for conducting this research starts from the stages of problem identification and instrument preparation, followed by expert validation and instrument testing, implementation of data collection in the field, to analyzing the results and interpreting the needs as the basis for the development stage of PjBL-based interactive media in further research (Fadli, 2021). With a systematic approach and based on real data, this research is expected to contribute to designing learning media that are more relevant, interesting, and in accordance with the characteristics of early childhood development. In tables 1 and 2 below are the grids of the Kindergarten B Child Learning Needs Analysis Questionnaire and the Kindergarten B Teacher Learning Needs Analysis Questionnaire.

Table 1. Learning Needs Analysis Questionnaire Grid for Kindergarten B children

No.	Aspects	Indicator	No.
1	Student readiness	Ability to recognize vehicle types	1,2
		Ability to recognize vehicle functions	3,4
2	Vehicle Concept Understanding	Recognize the shape of the vehicle	5,6
		Get to know the color of the vehicle	7,8
3	Interest in Learning	Interest in vehicle images	9, 10
		Interest project activities	11, 12
4	Cooperation Skills	Able to work together in a group	13, 14
		Able to share and listen to ideas	15, 16

Table 2. Kindergarten B Teacher Learning Needs Analysis

No.	Aspects	Indicator	No.
1	Curriculum	Compatibility theme vehicle with needs kindergarten B child development	1,3
		Relevance material vehicle with child's daily life	3,4
2	Learning Methods	Use of interactive learning methods	5,6
		Application of project-based learning method in vehicle theme	7,8
3	Learning Media	Learning media that attracts kindergarten B children	9,10
		Availability of technology-based learning media used in class	11,12

3. Result and Discussion

Kindergarten B Learning Needs Analysis Results

The following are the results of the needs analysis obtained through filling out a questionnaire on October 28, 2024. The author distributed learning needs analysis questionnaires to 10 kindergarten B children at Adventure Palembang Islamic Kindergarten with a total of 16 statements. Each aspect is calculated on average, In the figure 1 are the results and discussion :

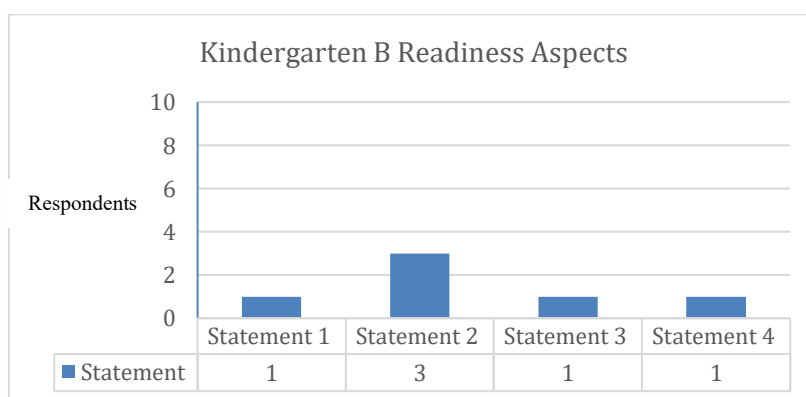


Figure 1. Aspects of Kindergarten B Readiness

In the aspect of children's readiness, there are 4 statements given to kindergarten B children, namely: (1) Children can mention certain types of vehicles, (2) Children recognize vehicles that are used daily (3) Children know the function of land vehicles (cars, motorbikes), (4) Children can explain the use of freight vehicles. The average score obtained from the readiness aspect of kindergarten B children is 0.15. The average value shows that the readiness of kindergarten B children in

understanding the theme of vehicles is still low. Of the 10 children analyzed, only a small proportion were able to fulfill each statement. For example, although some children could name certain types of vehicles, the number was not significant. The same goes for their ability to recognize everyday vehicles and explain the functions and uses of freight vehicles.

This suggests that the vehicle theme may still be abstract for children, requiring a project-based learning approach that allows children to be actively involved in the exploration of the vehicle theme. This is in line with the findings of Agustina (2021) that the implementation of Project Based Learning can significantly increase children's creativity in groups. This approach changes the conventional learning paradigm, where the teacher acts as the center of knowledge, to a process where children are actively involved in problem solving and collaboration (Agustina, 2021). To determine the extent of children's interest in the learning process, an analysis was conducted on several aspects related to learning interest. The results of the data collection are presented in figure 2 below.

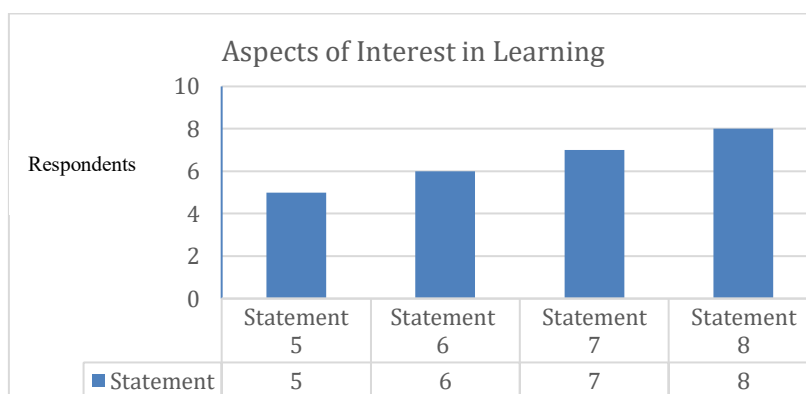


Figure 2. Aspects of Interest in Learning

In the aspect of understanding the concept of vehicles, there are 4 statements, among others: (5) Children can distinguish the shape of cars and motorcycles (6) Children can mention the shape of the vehicle they see (7) Children can classify vehicles based on color (8) Children can choose the appropriate color for each vehicle. The average score on the interest in learning aspect is 0.35. On the figure of the interest in learning aspect of the needs analysis for the development of interactive infographics with a vehicle-themed Project Based Learning learning model for kindergarten B children, it shows that there are variations in the understanding of the concept of vehicles among children. Based on the attached chart, it can be seen that the aspect of understanding the concept of vehicles has a moderate level.

This can be seen from children's ability to distinguish the shape of cars and motorcycles, mention the shape of the vehicles they see, and classify vehicles based on color. Although some children showed good ability in choosing the appropriate color for each vehicle, there is still room for improvement in their understanding. Therefore, the development of interactive infographics is expected to further

improve the understanding of vehicle concepts among kindergarten B children. The ability to work together is one of the important social skills that needs to be developed from an early age. To determine the extent of children's ability to work together in learning activities, the results of observations of several indicators of cooperation are presented in figure 3 below.

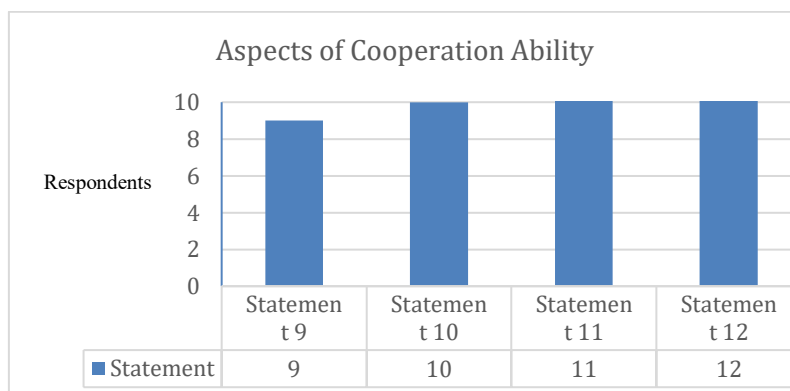


Figure 3. Aspects of Cooperation Ability

For the calculation of the average value in this aspect is 0.8. This diagram shows that the needs analysis for the development of interactive infographics with a vehicle-themed Project Based Learning (PjBL) learning model for kindergarten B children has a positive impact on children's concept understanding and interest in learning. Based on the analysis conducted, it can be seen that the aspect of children's concept understanding is classified as "high". This is supported by the data from the diagram which shows that children show significant interest in drawing vehicles, eager to participate in vehicle-making projects, and enthusiastic about using creative materials in the learning process. Thus, the application of interactive infographics in the context of PjBL not only improves concept understanding but also triggers greater interest in learning among children, so it can be an effective solution in the educational process at the kindergarten level (Afriani et al., 2022; Mansur & Rafiudin, 2020).

The figure cannot be shown for the Cooperation Ability Aspect of Kindergarten B children because the Kindergarten B children could not answer four statements on the Cooperation Ability Aspect, namely cooperating with friends, sharing roles, listening to ideas, and giving ideas. The low cooperation skills indicate that kindergarten B children need a more interactive, collaborative and structured learning approach to help them develop these social skills. The development of interactive infographic media based on *Project Based Learning* on the theme of vehicles can be an effective solution. This media can encourage children to share roles, listen to each other, and cooperate in completing group tasks, so that their social skills develop optimally.

Kindergarten B Teacher Learning Needs Analysis Results

The following are the results of the needs analysis obtained through filling out a questionnaire on October 28, 2024. The author distributed a questionnaire

analyzing the learning needs of kindergarten B teachers to 2 kindergarten B teachers at Adventure Palembang Islamic Kindergarten with a total of 12 statements. Each aspect will be calculated on average. To ensure that the learning media is appropriate for the objectives and content of the curriculum, an analysis of the relevant aspects of the curriculum was conducted. The results of this analysis are shown in figure 4 below.

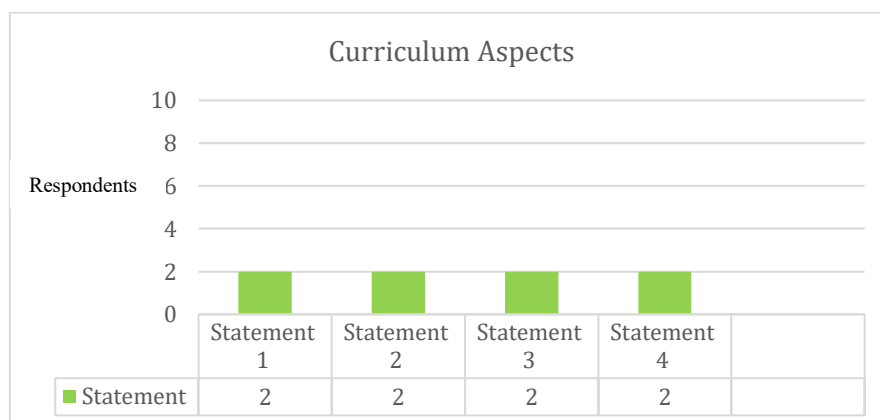


Figure 4. Curriculum Aspects

This figure is a diagram of the curriculum aspect in which the learning needs analysis questionnaire was given to TK B teachers. In the curriculum aspect there are 4 statements including: (1) Is the vehicle theme in accordance with the stage of development of kindergarten B children?, (2) Does the vehicle theme material support children's cognitive and social development?, (3) Can children understand the vehicle theme material based on their daily experiences?, (4) Is the vehicle material relevant to the child's living conditions at home or the surrounding environment? The average value in this aspect is 2. Based on data from the results of the learning needs analysis questionnaire given to kindergarten B teachers, the curriculum aspect shows a high category.

This can be seen from the level of suitability of the vehicle theme with the developmental stage of kindergarten B children, material support for children's cognitive and social development, children's ability to understand vehicle theme material based on daily experiences, and the relevance of the material to children's living conditions at home or the surrounding environment. All of these indicators received positive ratings, indicating that vehicle learning themes and materials are very suitable and relevant to support the infographic-based interactive learning process. The selection of the right learning method greatly influences the effectiveness of the learning process for children. To identify the most appropriate and necessary methods, an analysis of several aspects of learning methods was conducted. The results are presented in figure 5 below.

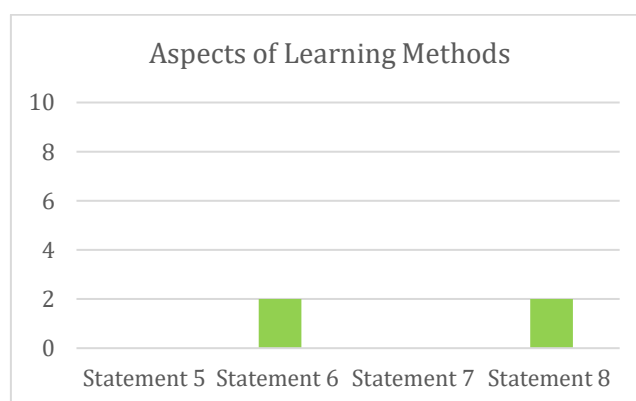


Figure 5. Aspects of Learning Methods

The results of the needs analysis of the development of interactive infographic media based on the *Project Based Learning* (PjBL) learning model on the theme of vehicles for kindergarten B children show that these needs are in the "medium" category. Based on responses from two kindergarten B teacher respondents, some of the main findings are as follows: learning methods used on the theme of vehicles are considered not fully interactive, active involvement of children in learning is not optimal, and the application of *Project Based Learning* (PjBL) methods on the theme of vehicles is still rarely done.

However, there are indications that PjBL can help children understand the concept of vehicles more concretely. This indicates the need for media development that can support the implementation of PjBL more effectively to improve learning quality and student engagement. Learning media plays an important role in supporting the achievement of effective and interesting learning objectives for children. For this reason, an analysis of the aspects of learning media required was conducted. The results of this analysis are presented in figure 6 below.

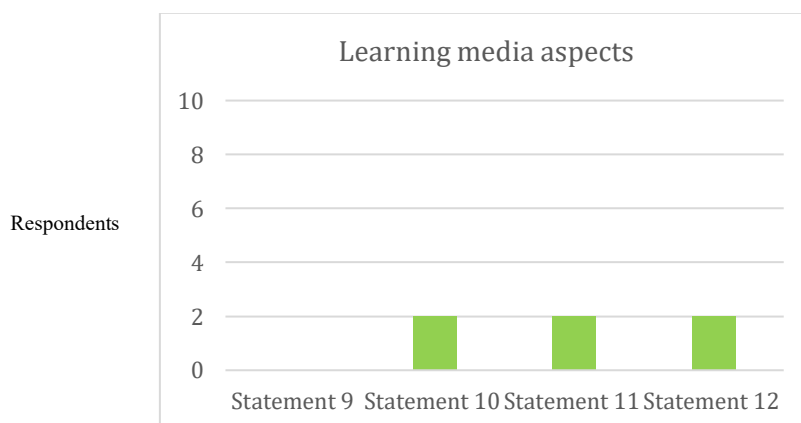


Figure 6. Learning Media Aspects

The average score on the learning media aspect is 1.5. The results of the needs analysis show that the level of need for the development of interactive infographic media based on the *Project Based Learning* (PjBL) learning model on the theme of vehicles for kindergarten B children is in the "high" category. Based on the results

of a questionnaire with a Guttman scale given to two kindergarten B teachers, it was found that the learning media used on the theme of vehicles had not fully attracted children's attention. In addition, the existing learning media has not been able to optimally motivate children to participate more in learning. The use of technology-based media on the theme of vehicles has also not been applied frequently, although teachers agree that the media can help children understand the material more clearly (Fauziah et al., 2023; Putri & Ana, 2024; Windayana, 2018). These findings emphasize the need for the development of technology-based learning media that are interesting, interactive, and in accordance with the PjBL approach to improve the quality and effectiveness of vehicle theme learning.

Discussion

The results of the needs analysis showing the low readiness of kindergarten B children in understanding the theme of vehicles indicate that children at an early age stage need a learning approach that is not only informative, but also contextual and participatory. The average score of 0.15 in the aspect of children's readiness shows that most children have not been able to mention the types of vehicles, understand the functions of vehicles, or explain the use of freight vehicles. This finding reinforces the view of Aeni & Setiasih (2024) which states that early childhood is still in the concrete thinking stage, so it requires learning experiences that are direct and real. They emphasize that visual learning media such as infographics, as well as explorative activities, can help overcome children's difficulties in understanding abstract concepts.

Children's unpreparedness can also be attributed to the low exposure to media or learning approaches that are interesting and suitable for early childhood characteristics. In this case, the use of the Project Based Learning (PjBL) learning model is a promising alternative. Irayana & Assyauqi (2024) shows that the application of PjBL in playgroups can increase active participation, critical thinking skills, and children's creativity. This is supported by the statement Hasni & Amanda (2022) which found that children who were involved in real projects such as making vehicle mockups or role playing using toy transportation had a significant increase in understanding and interest in learning compared to children who only followed conventional learning.

Furthermore, the mean score of 0.35 on the interest in learning aspect shows that although some children showed interest in the concept of vehicles, their understanding was still moderate. This suggests that the learning media used previously has not been effective enough in building children's interest in the material. In this context, interactive infographic media can play an important role in building visual and cognitive appeal, as explained by Putri & Ana (2024.) which states that children more easily understand information if it is presented through familiar colors, images and symbols. They also found that infographic media was able to increase the attention and information retention of children in kindergarten who were respondents in their study.

The aspect of cooperation skills also showed its own challenges. With an average score of 0, this ability is very low. In fact, cooperation is one of the important social-emotional development indicators at kindergarten age. This result is in line with research Ardiana (2022) dan Hasni & Amanda (2022) which emphasizes the importance of using collaborative methods in early learning. In their research, they showed that children involved in group projects were better able to demonstrate social behaviors such as sharing, listening to friends' opinions, and resolving minor conflicts independently. Therefore, the application of group-based PjBL not only helps children in understanding the material, but also supports the development of social-emotional aspects holistically.

From the teachers' side, the results of the needs analysis show that there is a high need for the development of learning media that is interesting and in accordance with the curriculum. The high average value of the curriculum aspect (2) shows that teachers have realized the importance of the connection of the material with children's daily lives, but this has not been balanced with supporting methods and media. As revealed by Asyruni Multahada et al. (2022) dan Harliza & Kurniah (2021) kindergarten teachers face challenges in choosing media that are not only educational, but also fun and in accordance with technological developments. They recommend the development of interactive digital media to accommodate the needs of teachers in delivering complex materials such as the theme of vehicles.

In the aspect of learning methods, the moderate category value (1) indicates that the PjBL approach has not been fully implemented in the classroom. This confirms the results of research from Hasni & Amanda, (2022) dan Pratiwi et al. (2018) , which states that one of the main obstacles to implementing PjBL in kindergarten is the lack of supporting media and teacher training. Therefore, the development of interactive infographic media specifically designed to support the implementation of PjBL is very relevant in this context.

The aspect of learning media that received a high average score (1.5) shows the urgency of learning media innovation in Adventure Palembang Islamic Kindergarten. The media used has not been able to fully attract children's attention and has not often utilized technology. This reinforces the findings of Harliza & Kurniah (2021) , who found that the use of technology in the form of interactive media can significantly increase children's motivation to learn, especially when the media is developed based on themes that are close to children's lives.

By considering the results of this study and comparing them with previous studies, it can be concluded that the development of interactive infographic media based on vehicle-themed PjBL is not only a solution to the needs of children and teachers, but also in line with the trend of adaptive, contextual, and technology-based learning innovations. This kind of media is expected to not only improve children's learning readiness, interest, and cooperation skills, but also assist teachers in implementing more effective and meaningful learning.

4. Conclusion

Based on the results of the needs analysis, it can be concluded that there is a high urgency in developing interactive infographic media based on the Project Based Learning (PjBL) learning model on the theme of vehicles for kindergarten B children. Children's readiness and understanding of the concept of vehicles is still relatively low, while aspects of interest and involvement show positive potential that needs to be optimized through a more active and collaborative learning approach. On the other hand, teachers expressed a significant need for relevant, interesting and technology-based media, in line with the curriculum and PjBL approach. Therefore, the development of interactive media is a strategic solution to improve overall learning effectiveness.

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