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Media Roll Book for Early Physical Science

Nurul Istiqomah [1]
Hapidin[2]
Elindra Yetti[3]
Universitas Negeri Jakarta, Indonesia[1,2,3]

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ABSTRACT: Studying physics and then teaching it to children, as is known from decades of science education research, creates a huge problem of unknown origin. This study aims to develop a media and determine its effectiveness in increasing knowledge of physics for children. This research is a research and development with the stages of the ADDIE model to develop Roll Book media with the roll technique containing physical science material for early childhood. Data collection techniques were carried out through expert validation tests and field trial data. Analysis of effectiveness test data using a paired sample T-test statistical test. The results of the media effectiveness test showed an increase in knowledge of physics in the pre-test and pots-test. The summary of all the test results of the developed media shows that Roll Book products are effectively used to increase children's knowledge of physics. The concept of storybook media that has been developed in various interesting forms is expected to be an alternative solution for the scientific development of early childhood education studies.

Keywords: Early childhood, Physical science, Roll book

[1] Corresponding Author:
Early Childhood Education Postgraduate Program, Universitas Negeri Jakarta
Email: nurulistiqomah2605@gmail.com

1 INTRODUCTION

Learning carried out in early childhood education includes science content, one of which is a physical science that is important to children from an early age. Unfortunately, children are less interested in physical science. Research conducted by Fridberg et al., (2019) suggests that many studies have found that children have a low interest in science, especially chemistry and physics. The research findings are the impact of the less-than-optimal learning of science in early childhood education. Furthermore, a survey to do a researcher in one of the kindergartens in east Jakarta that has been carried out in the field through interviews with teachers and kindergarten principals, obtained data that the introduction of physics is still very rarely given to children. The introduction of physical science in early childhood education has not been carried out optimally, which is indicated by children not understanding why objects can move left or right (Citra et al., 2019). Physics for children are still considered too difficult to be given to children. So far, science learning uses materials to experiment. Science learning, especially physics content for children, is still rarely given. Media related to physics, literacy media in the form of picture story books that are suitable for children are also not yet available.

Results of field surveys by a researcher found that lack of support for science introduction media for children is one of the factors that children's low interest in studying science. This is reinforced by research conducted by Larasati and Yulianti, (2014) on the development of science teaching materials (physics) which shows that many teachers have difficulty in teaching science in kindergarten because so far there have been no guidebooks and accompanying books for teachers regarding science material based on the theme. A result of field surveys by a researcher found media introduction to science in the form of picture story books are also still very rare in the market. The difficulty of getting media makes teachers provide science learning with activities that are usually carried out. Learning media for children can be developed to support science learning, especially about physics for children. One of these media developments is picture story books that are suitable for early childhood. The facts in the field show that the problem is the lack of interesting literacy media and contains the right content for children, especially with the theme of introducing physics to children.

Introduction physics science with media because media can be a tool that is part of science exploration that children can do. The following is studies that are used as references to provide evidence on how preschoolers respond to auditory and visual support when engaging with print and picture media during electronic storybook reading sessions. The research confirms that the media has a major role in the learning of preschool children (Skibbe et al., 2018). Furthermore, research about introduce physics science specifically learning about magnets with picture books by Kalogiannakis et al., (2018) eaching about magnets in preschools using the method of reading picture story books can provide benefits for children who learn about magnets. The results showed that reading picture books is an interesting activity for children and can provide science lessons in an effective, meaningful, interesting, motivating and especially funny.

The teacher needs to consider the right media in early childhood so that children can enjoy following the learning process and fostering natural curiosity. Selecting and determining the right learning media for early childhood success is one of the teacher's tasks as part of learning planning. Inappropriate media can make children feel bored and reluctant to follow the learning process. The selection of media needs to be done by considering the stages of age and development of children. Teachers cannot necessarily generalize the media for the learning content delivered and the expected developmental aspects. The teacher must consider several aspects in choosing the right learning media, including the teacher feels that he is already familiar with the learning media so that he chooses the media, the teacher feels the learning media can describe it better than himself, the media can attract students' interest and attention (Arsyad, 2013, p. 67). So, it is important for teachers to choose the right media to use during the implementation of learning.

Based on the facts and relevant research problems related to the introduction of physics in children and picture book's media in early childhood, it is necessary to research the development of media for the introduction of physics picture stories for children using the roll technique. Media with a different and new look is expected to stimulate children's curiosity. The illustrated storybook media coupled with the innovation of the rolling technique certainly has its own charm for children, with the scrolling technique, it will provide a variety of learning for children to minimize boredom in learning. Physics science content is also still very rarely given to children, so it will be interesting if there is a picture story book with roll innovation that contains physics science content.

2 THEORITICAL STUDY

2.1 *Physical Science in Early Childhood*

In the process of teaching science in preschool, teachers must consider several aspects. Research by Gitomer and Zisk (2015) identified that teachers' knowledge of science content is one of the determining factors in science learning in early childhood. However, other factors, including the perspective and attitudes of teachers towards science, impact children's science learning (Fleer, 2015; Thulin & Redfors, 2017). In addition, the pattern of communication between teachers and students related to 'learning objects' in preschool, namely knowledge or about certain content abilities that children must master, affects the success of science learning (Marton, 2014). Another research has shown that children's learning is highly dependent on communication, for example, when children want to understand the world around them and share it with others (Fleer, 2015; Thulin & Jonsson, 2014). Based on the results of these studies, teachers should find ways to support the creation of a connection between the child's perspective and the object of study learning that is according to the child's language and is carried out contextually in scientific concepts that become the object of learning (Fridberg et al., 2019).

Teaching physical science to early childhood is a challenge. Numerous studies have demonstrated that young people lack interest in science, particularly chemistry and

Physics (Oskarsson & Karlsson, 1970; Sjøberg & Schreiner, 2010). Fridberg et al., (2019) research time used science in society – in children's everyday lives – and child-centered approaches as starting points. The findings demonstrate that inter subjectivity can manifest in various ways, with varying implications for children's abilities to experience the intended goal of learning. According to this, teachers need to communicate with pupils simultaneously about a given subject is emphasized. Teachers must establish connections between the child's perspective and the subject of study. The role of intermediate objects of learning in the conquering of new knowledge is examined.

Children like to observe a certain object around them, including the object's physical properties and observing what happens from the object (Kamii & Vries, 1993). Children's activities related to physical science can stimulate inquiry and problem-solving skills. Children's direct experiences related to physical science activities that children usually do every day can build children's abstract science knowledge into more concrete (Woodard & Davitt, 1987). Physic activities in early childhood, such as manipulating an object such as rolling a ball, kicking a ball, bouncing a ball, throwing a ball, etc. Through manipulative movements, children learn how the various movements can affect different ball movements (Woodard & Davitt, 1987). Physical science is an important content to give to pre-schoolers. Early childhood needs to be given an understanding of it because of the natural needs of a child, such as (1) Children like to observe and think about nature and tools. (2) Exposing children to physics develops a positive attitude towards science. (3) Exposure to scientific phenomena leads to a better understanding of later formally studied concepts. (4) The use of scientifically informed language at an early age influences the eventual development of concepts. (5) Children can understand scientific concepts and reason. (6) Science is an efficient means to develop critical thinking (Eshach & Fried, 2005; Greenfield et al., 2009). In addition, physical science activities such as investigating an object and material, forming an object, selecting appropriate materials and adapting observations made, and finding out about different things from the events they can improve their cognitive development (Featherstone, 2003). So that learning it at an early age by using the right media to deliver content that is appropriate for its development is important.

Gur (2011) introduces how to teacher should be teaching physical science. He states that teachers should assist students in analysing their observations (how and why), comparing, inferring, and hypothesizing. Meanwhile, asking open-ended questions may help students develop the ability to establish connections between concepts and between past and present events. Additionally, it may help with analytical, inferential, and hypothesis-generating abilities. Children naturally engage in exploration and inquiry. Teachers can foster this curiosity by assisting students in developing their scientific reasoning abilities.

According to Lind (2005), the scientific thinking process has eight activities: observing, comparing, classifying, measuring, communicating, inferring, and predicting. This statement is consistent with the learning approach outlined in Indonesia's 2013 early

childhood education curriculum. Children at this age recognize their environment and build their knowledge first through observation. This observation is a fundamental part of the scientific process.

Children can carry out the observation process using their five senses to gather the information they want to know from an early age. Children go through the observation process by seeing with their eyes, hearing with their ears, filling using their sense of touch, using their tongue, and smelling using their nose. This process is naturally carried out in early childhood, a fundamental part of the scientific process. In its development, this observation process needs to be done carefully to collect information. The observation can be combined with drawing in early childhood, where children draw what they see and the details they notice. This encourages them to examine objects closely and draw as they see them (Angelica Torres & Vitti, 2007). he teacher can ask open-ended questions that can stimulate children to make observations such as, what are the characteristics of what object's children observe and ask them to describe it in detail?

Physical science's importance for young children is not to impart knowledge of scientific principles, concepts, or explanations. Rather than that, it is to provide opportunities for the childhood to interact with and observe items in order to provide the groundwork for physics (Kamii & Vries, 1993). Children's intellectual growth is aided by experimentation and active participation in their environment. In preschool classes, it is critical to assist young children in making connections between personal occurrences and science topics (Saçkes et al., 2012). Preschool teachers can incorporate physics into their students' daily lives.

Physics in preschool help children develop cognitively, language-wise, socially, and emotionally. A review of the available research indicates that physics are also necessary for pre-schoolers. When teaching physics, the teacher should emphasize modelling, choose topics that are interesting to children, design activities with their learning styles in mind, encourage children to ask questions and express themselves, and supplement their observation and discovery skills with occasional school trips. For preschool children, concrete materials and real-world issues make schooling more effective. Scientific reasoning is also critical for good education. It encompasses the abilities to observe, compare, classify, measure, communicate, infer, forecast, hypothesize, and control. Teachers must highlight the development of each sub-process and assist children in their development by providing varied experimental opportunities and asking open-ended questions about their experiences.

Children should not only be taught fundamental physics concepts and principles, but also given opportunities to interact with objects and observe their reactions. In other words, they should be capable of erecting the physical foundation. To accomplish this successfully, it is critical to integrate physics into children's daily lives. Children must be given the opportunity to make observations, live their own experiences, and discover the answers to their questions using simple tools. Physics are not a difficult subject for preschool children to comprehend. When everyday concerns are chosen and children

explore and experience simple tools, generate and test hypotheses about events, and are asked open-ended questions, physics become an approachable and enjoyable subject for them. Children are naturally curious and enjoy learning via play and observation. Teaching physics in this manner, introducing pre-schoolers to fundamental physics ideas, and enabling them to learn by doing and apply physics to their daily lives, will contribute significantly to the development of future scientists.

Reinforces that physics for early childhood is not to teach concepts, principles or scientific explanations, more precisely physics for children is to provide opportunities for children to act on objects and see how objects react, which aims to build the foundation of children's physics knowledge (Gur, 2011). The National Science Education Standard (NSES) in Charlesworth and Lind (2012) states that as a process of activities in elementary grades, all children can develop physical knowledge, which includes the properties of objects and materials, position and motion of objects, light, heat, electricity and magnetism. Furthermore Thorson, (2017) suggests that science that is suitable for children is motion, magnetism, sound and light. In line with this, the California Department of Education also explained that the concept of physics science for children is about investigating the physical characteristics of objects and materials (weight, size, and texture), changes in material objects (solid and non-solid substances) and motion of objects (attractive pushing or twisting) and about sound, light and shadow (California Department of Education, 2012).

The content physics science about light is explained in a book entitled physical science teacher guide, explaining that light moves in a straight line, light will move through transparent materials, if an opaque object is placed in the path of light, the light will be absorbed, reflected, or refracted. It further explains that light can also reflect and be reflected from objects. In line with this, related from the book math and science by Charlesworth and Lind (2012) It asserts that children need a lot of concrete experience with light to provide the conceptual background for later understanding. The National Science Standard also explains about light, that light is in a straight line until it hits an object, and light can be reflected by a mirror, refracted by a lens, or absorbed by an object.

2.2 *Book as learning media*

Early childhood education influences how media are used to pique children's attention. In early childhood, books are frequently employed as a medium of instruction. Teachers employ books as a medium of instruction in early childhood education. Several scholars from throughout the world have conducted numerous studies on the usage of book media. The use of books as a medium of instruction has several advantages and efficacy that can help a youngster develop his or her abilities. According to Hsiao and Chang (2015), the study's findings indicated that the key factors influencing picture book selection was 'theme' and 'adopting a child's perspective. The implementation of picture book teaching tactics focused on’ ways for promoting thinking and activities' and 'developing children's different talents, and children developed a greater care for the environment.

Numerous earlier researchers have produced books with a variety of different designs. Previous study conducted Sari and Suryana (2019) on the development of thematic pop-up book media concluded that the trial results of thematic Pop-Up book goods in Kharia Kindergarten Islamic Ummah indicated that they were a suitable medium for children with a percentage increase, attained a score of 96 percent in the test. These findings demonstrate that children and teachers alike respond well to Pop-Up Book media items. Another study conducted by Solfiah et al., (2020) on the development of picture storybooks found that children's understanding about disaster management was 47.92 percent on average before the exam, but improved to 76.88 percent after the test. This suggests that picture-book medium can be effectively used to raise public awareness of disaster management.

Additionally, Mutmainnah et al., (2021) demonstrate that expert results are 100 percent accurate, media experts are 96 percent accurate, cultural experts are 96 percent accurate, small-scale trials are 3.9 percent accurate, and large-scale trials are 4.6 percent accurate. Based on designing and testing learning media for picture books with an Acehnese culture subject to increase children's interest in the Acehnese culture. The usage of illustrated storybooks in elementary school is critical because they help develop students' imagination and curiosity about the learning material. Picture Books with various designs that have been developed previously could be an effective medium to improve the abilities of early childhood (Dewi et al., 2018).

2.3 *Physical science using media*

Introduction to science, especially physics, can be done using media. Media can be a tool that is part of science exploration that children can do. One of the media in question is picture story books. The results of research by Kalogiannakis et al., (2018) teaching about magnets in preschools using the method of reading picture story books can provide benefits for children who learn about magnets. The results of this study indicate that reading picture books is an interesting activity for children. Giving science lessons in this way is effective, meaningful, motivating and especially funny. Further research by Pramitasari et al., (2018) on the development of media like books about the introduction of life science (science of life) through the development of media marine sliding book. This study designed a sliding book to demonstrate the effectiveness test utilizing a quasi-experimental study approach that included pre- and post-tests and paired t-test analysis. The results of the sample's test performed with SPSS yielded a Sig. (2-tailed) Value of 0.000, implying that the data reveals a difference between before and after the usage of sliding book medium for the introduction of marine life sciences. The sliding book here is a picture story book that introduces life-science children using the technique sliding. Benefit of a story book can explain that illustrated stories are a medium for delivering strong messages for early childhood with the advantage of attracting children's attention to the content of stories and pictures that can provide illustrations that cannot be explained in words.

Phillips and Sturm (2013) suggest that picture books related to kindergarten children have a strong impact on children and families experiencing transitions in introducing children to start kindergarten school. This study examines picture books that introduce children to kindergarten with the aim of enabling children to overcome their fear of starting school. Research on the picture-book media by Oppliger and Davis (2016) s an analysis of how bullies and victims are depicted in picture books suitable for preschool children. Howard Gardner argues that picture books are important learning tools because they provide words and pictures, and therefore can benefit from a variety of learning styles.

Subsequent research is also on picture story books by Kelemen et al., (2014) who in their research use picture story books because the format is child-friendly and invites a context for shared learning useful. In addition, the narrative enriched with pictures makes it easier for children to learn simple biological facts to generalize those facts to the real thing. This study is an experimental study whose findings show that basic natural selection can be taught in early childhood using picture story books with an explanatory structure that is rich in benefits.

3 METHOD

Research and development of this media uses a model that focuses on the development of learning media. The ADDIE design (Branch, 2009) has the advantage that it has a systematic work procedure, at every step that will be passed, it always refers to the previous step has been improved so that it is expected to obtain an effective product. The ADDIE model also looks simpler and more suitable for research and development than other learning design models. In this study, the designs used were pre-test and post-test. This study involved 13 children and one teacher of Kindergarten B-1 Islamic Kindergarten At-Taqwa Rawamangun Pulogadung, East Jakarta. The research was carried out in February 2021.

3.1 *Procedure*

The ADDIE model also looks simpler and more suitable for research and development compared to other learning design models. This research and development study uses the ADDIE model is an acronym for Analyse, Design, Develop, Implement, and Evaluate. The procedure carried out by researchers in the study, as described in figure 2, goes through five stages.

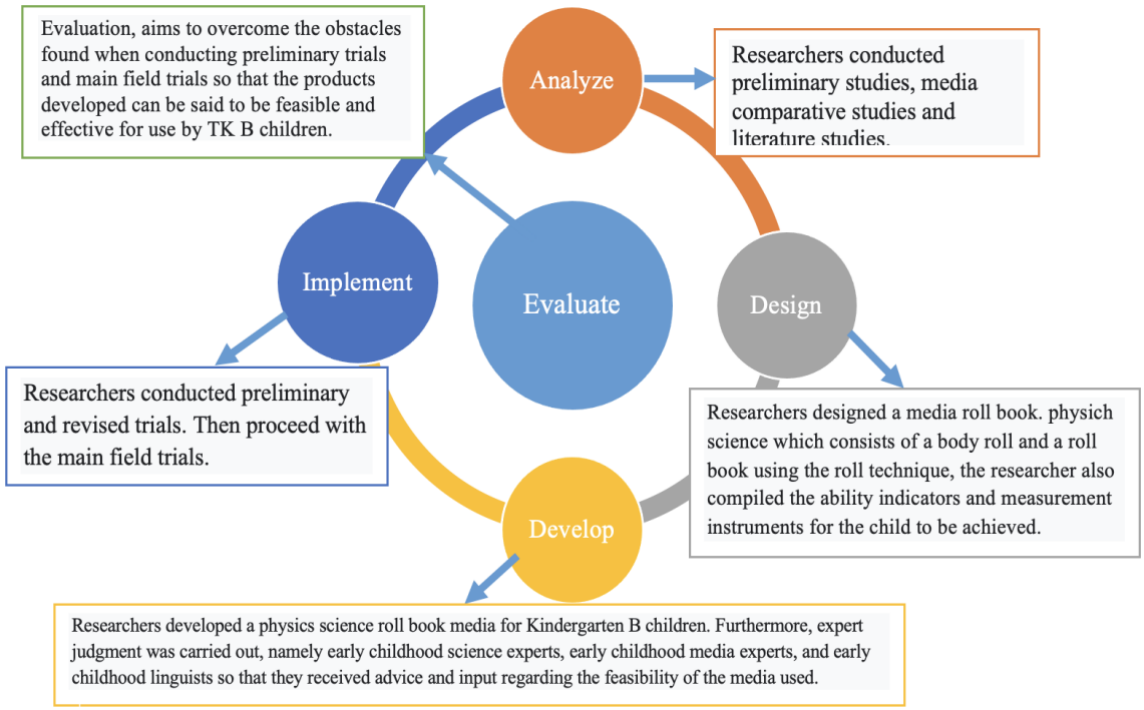

Figure 2. Media Roll Book Procedural Design

3.1.1 *Analyse*

At this stage, researchers conduct a need's analysis through preliminary studies, comparative media studies, and literature studies. Researchers conducted a need's analysis by identifying the media used in early childhood physical science learning used in early childhood education Indonesia's context. The research also compares various existing media and the level of effectiveness in the science learning process. And the researchers conducted a literature study as a reference for designing the physical science roll book.

3.1.2 *Design*

At the design stage, researchers designed a media roll book. Physical science consists of a body roll and a roll book using the roll technique. The researcher also compiled the ability indicators and measurement instruments for the child to achieve. The media roll book designed by the researcher refers to the literature related to the book's appearance and the content of the book to be developed. The media content of this roll book specifically challenges physical science in early childhood, which is adjusted to the content agreed upon by the experts and included in the 2013 curriculum.

3.1.3 *Develop*

At this stage, researchers developed a physical science roll book media for Kindergarten B children. Furthermore, expert judgment was carried out, namely early childhood science experts, early childhood media experts, and early childhood linguists to receive advice and input regarding the feasibility of the media used.

3.1.4 *Implements*

Researchers conducted implemented tests and revised trials. Then proceed with the main field trials. At this stage, the researcher implemented the physical science roll book media to determine the effectiveness of using the roll book media developed in this study.

3.1.5 *Evaluation*

The final stage in this research procedure is the evaluation stage which aims to overcome the obstacles found when conducting preliminary and main field trials. The products developed can be said to be feasible and effective for Kindergarten B.

3.2 *Instrument*

The concept of physics science for children that adopt from California Department of Education (2012) is about investigating the physical characteristics of objects and materials (weight, size, and texture), changes in material objects (solid and non-solid substances) and motion of objects (pulling, pushing, or twisting) as well as about sound, light (light can be reflected by a mirror, refracted by a lens, or absorbed by an object) and shadow. In this study, the instruments used to measure knowledge physics science children's which has been adapted according to the needs of this research (see table 1).

Table 1. Physics Science Instruments

Aspect	**Indicator**	**Items**	**No**
Energy (Light, reflected light, rainbow)	Describe what is rainbow	2	1,6
	State the causes of rainbows	2	2.7
	Mention the different colours of the rainbow	2	3,8
	State when the rainbow occurs	2	4,9
	Describe the process of rainbow	2	5,10
Movement (Pushing and roll)	Describe what is a hurricane	2	11,16
	Mention safety instructions	2	12,17
	State things to do when there is a hurricane	2	13,18
	Mention the consequences of the hurricane	2	14,19
	Describe pushing and rolling	2	15,20
	Amount	**20**	

3.3 *Data Collection Techniques*

Researchers analysed all findings about the process of increasing knowledge of physics science in Kindergarten B children using roll book media. This Research and development use qualitative and quantitative data analysis techniques. Analysis of data obtained through data from interviews, observations, documentation, field notes and questionnaires. The data that has been obtained from the test results are then analysed by comparing the children's scores pre-test and post-test. This test is done to see the difference in knowledge of physics science, for statistical calculations using the paired t test formula.

4 RESULT AND DISCUSSION

4.1 *Result*

4.1.1 *Design of Media Conceptual Development*

The conceptual model is designed based on the need for learning media in providing science learning, especially content physics science, model based on need's analysis, which includes a survey of media availability, interview of science activities in school and relevant research. Based on the results of the preliminary study, it is necessary to develop media in the form of picture story books using innovation roll. The main point in the development of this picture story book is a medium for learning science and knowledge of physics science. With the availability of learning, media can make learning interesting and fun.

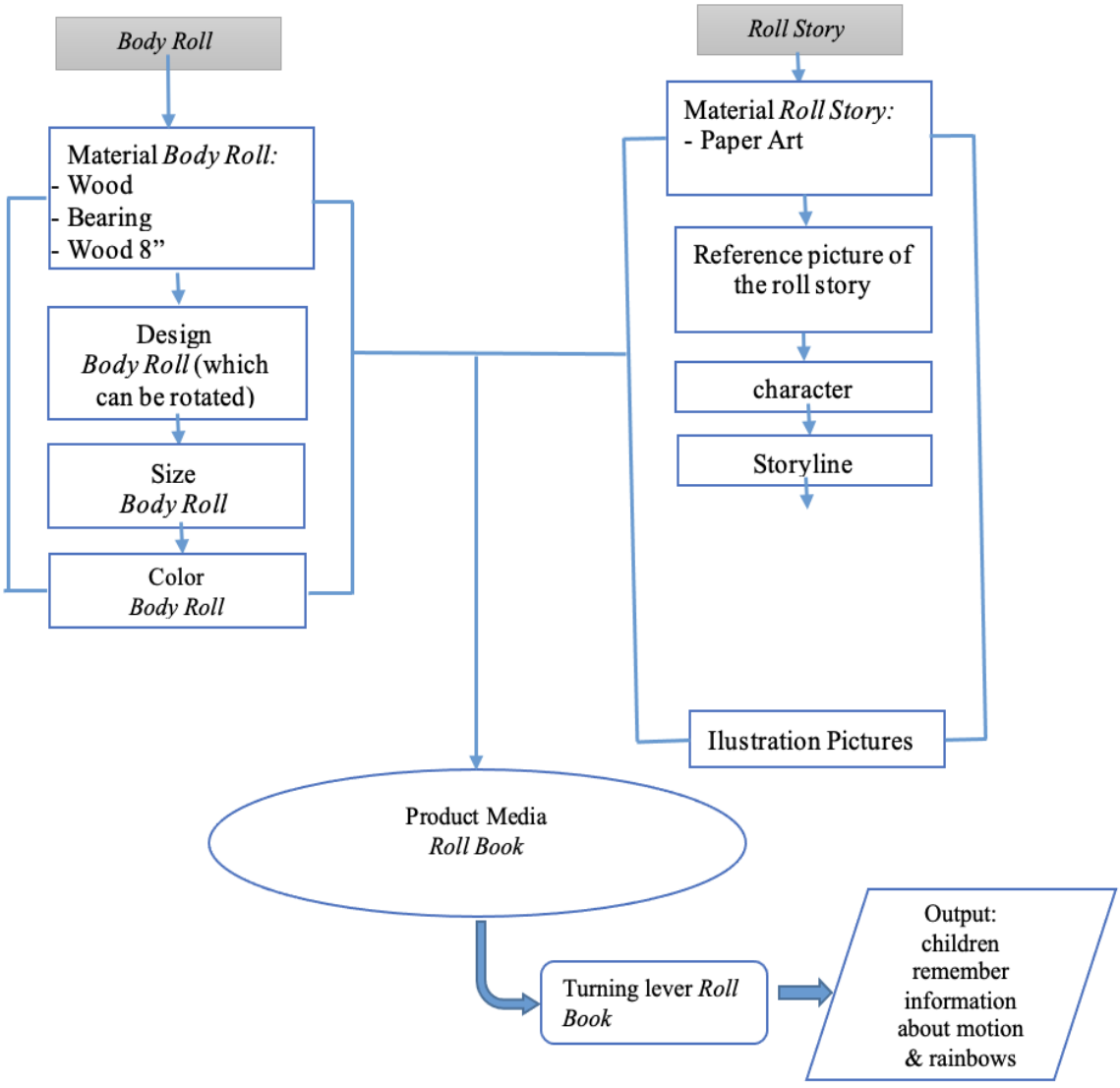

Figure 1. Flowchart Conceptual Media Roll Book

4.2 *Development of Roll Book*

Media Roll book's media (see figure 3) is a type of story book media in the form of three dimensions. There are body rolls and roll books as the main components of this media. This media includes the type of print media in the form of picture story books that can convey information about science, especially physical science knowledge about motion (rotating and pushing) and light (bending light, namely the process of the occurrence of a rainbow).

Figure 3. Roll Book Physics Science Front View and Side View

4.2.1 *Expert Judgment*

This research involves experts to test the feasibility of the developed media including early childhood science experts, early childhood media experts and experts' early childhood language, the following is a recapitulation of feasibility from experts (see table 2).

Table 2. Recapitulation of Expert Validation

Expert	**Results of Feasibility**	**Qualification Assessment**
Early Childhood Science	96,25%	Very Worthy
Early Childhood Media	69,57%	Worthy
Language Early Childhood	89,15%	Very Worthy
Average Rating Result	**84,99%**	**Very Worthy**

Based on the table above, it can be concluded that according to early childhood science experts, this media is very feasible to use in the field.

4.3 *Media Effectiveness*

Results The effectiveness of the media (see figure 4) was based on a main field trial involving 13 children and one teacher at Kindergarten B-1 Islamic Kindergarten At-Taqwa Rawamangun Pulogadung, East Jakarta. The main field trial was carried out in three meetings with one meeting for 50 minutes. The first stage of implementing the main field trial is conducting online learning by conducting questions and answers about hurricanes and rainbows. In this first stage, the children immediately took a sober quiz as a pre-test, not being shown the media video first roll book. The second stage of the field trial was used as a post-test for the title of the story is *Angin Ribut*. This third stage of the field trial was used as a post-test for the title of the story is *Bidadari di atas kayangan*.

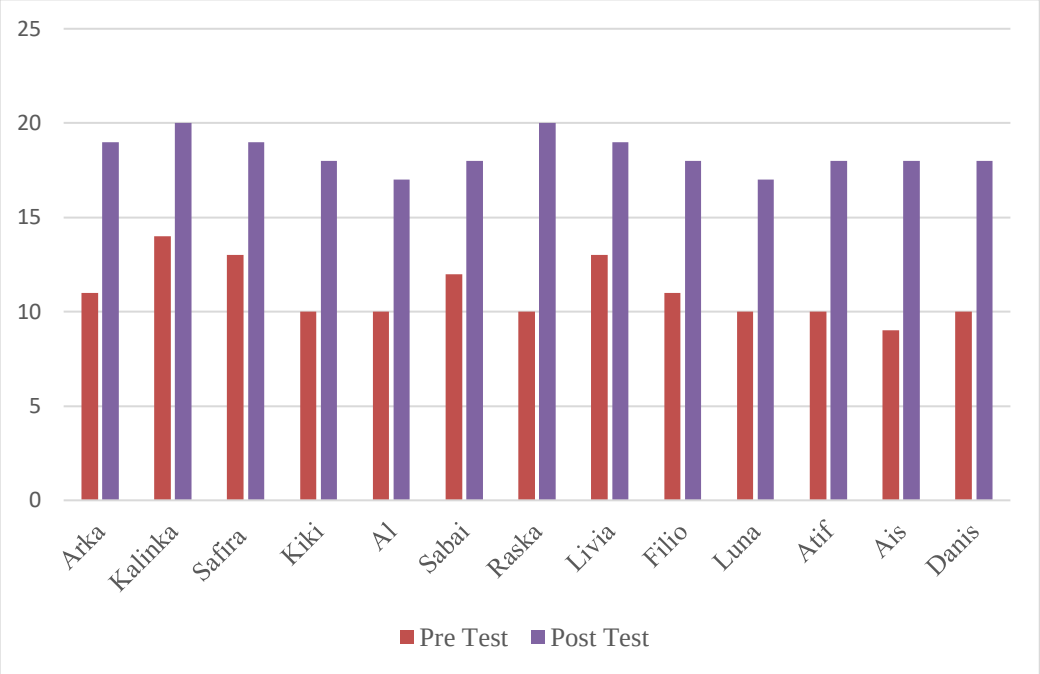

Figure 4. Score Pre-Test dan Post Test with Media roll book

Furthermore, the effectiveness test in this study used arithmetic media using paired t test through the SPSS application. Paired t-test was carried out on subjects who were tested in the conditions before and after the process (see table 3).

Table 3. Test the effectiveness of pre-test and post-test

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std Erroı Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	Pre-test-post-test	-0.76923	.59914	.16617	-10.13129	9.4071'	-58.790	12	<,001

Based on the calculation of the paired samples test with SPSS, the average value (mean) -7.38462 is obtained from the average difference before using the media and after using the roll book media. The standard deviation shows a value of 1.26085 which is the

standard deviation of the difference between before and after the use of physics science roll book media. Then for the confidence interval of the difference, the value lower= -8.14654 and upper = -6.62269, which means the interval indicates the area where there is a difference in recognition at the 95% level. The results of the t-test show a value of -21.117 which means it is greater than the t-table of 2.681 at the 99% level, which means that the difference in knowledge of physics science is accepted at the 99% level. Then Sig. (2-tailed) shows the results of <0.001, so the value of <0.001 <0.05 then the data showed that there is a difference from before and after the use of media roll book to increase knowledge of physics science. or H_a accepted based on the results of the effectiveness test, it can be concluded that media is roll book effectively used for kindergarten B children.

4.4 *Discussion*

The research and development of this media started from problems in the field, namely the lack of science learning media, especially those containing content physics science. Research conducted by Citra explains that the introduction of physical science in early childhood education so far has not been carried out optimally. It was further explained that children still had not shown an understanding of objects or non-living objects such as the nature and changes of substances such as water, and motion in the surrounding environment, so they are less concerned about what is in the environment. Furthermore, according to Charlesworth and Lind (2012) argues that the hope for children in studying physics is that children can understand the nature of objects and materials, position and motion, energy, light, heat, electricity and magnetism.

The introduction of physical science has not been carried out optimally due to several factors. The first factor is due to lack of stimulation and recognition from the environment around the child. The second factor is the lack of scientific media that contains physical science content. The third factor is that there is still an assumption that the introduction of physics for children is too difficult. This was obtained through the results of interviews with teachers in Kindergarten B. This is supported by the results of a comparative study of science books for children. No one has developed a story book an early childhood with innovation roll, which contains story material of the science of physics, knowledge of motion and movement light. Media roll book physics science was developed with the aim of providing physics knowledge to children as early as possible. This media was developed with the addition of technique innovation roll that can be an attraction for children and is designed with a simple story. It is hoped that this media will be developed so that it can become one of the literacy media, especially for early childhood physics knowledge so that children can recognize and experience physics knowledge with interesting and fun media.

Findings in the field during the main field trial about increasing knowledge of physics science for children at Kindergarten B Islam At-Taqwa Rawamangun, East Jakarta, were seen during the review of learning after carrying out learning, namely watching videos of hurricanes and carrying an out windstorm sober quiz. Children understand about motion

(turning and pushing) by defining it through body movements. As done by a child named Kiki, who said, "It's like a hurricane earlier, turn ... turn ..." (while doing body movements twisting while sitting. The same thing was done by Sabai. Sabai made body movements twisting while lying face down hands while twirling. Meanwhile, knowledge physics science about light (bending light, which is the process of creating a rainbow) was also seen during the review. The children defined rainbows with various versions of the answers. When the researcher asked what they had learned today, several children raised their hands to answer the question by recounting what they had done. As it was done by a child named Kalinka. The following is the conversation: Kalinka: “I am the teacher… there are many colours of the rainbow, there are red, yellow, pink, green and purple." Researcher: "Where do those colours come from, Kalinka? Kalinka: "From light, right? Teacher" Researcher: "Yes, it's reflected light," the researcher answered.

The findings in the field regarding the understanding of physics science for Kindergarten B children are in line with research by Kalogiannakis et al., (2018) which according to the results of his research also explains that through illustrated story books, he will reflect the knowledge he has gained, namely knowledge about magnets by drawing back with the child's own version. Children prefer to express through pictures rather than asking questions directly with the teacher. This is reinforced by the results of research (Lorente, 2017; Oppliger & Davis, 2016) states that picture story books provide knowledge for early childhood, picture story book media can provide stories or writings and pictures, narratives enriched with pictures make it easier for children to learn them. The findings in the field and research results show that using media roll book can provide science learning that collaborates with science activities for early childhood.

4.4.1 *Limitations*

This research and development focus on increasing the knowledge of physics science for children at the age of Kindergarten B. The knowledge of physics science intended includes the motion (turning and pushing) of light (refraction of sunlight, namely the process of the occurrence of rainbows)**.** Given the relatively high cost of production, it is impossible to produce in large quantities.

5 CONCLUSION

This research resulted in a learning media product, namely a roll book in accordance with the research objective, which is to provide interesting and fun learning and as a new reference in the learning process that can combine learning activities with learning media. This media is also in the form of picture storybook media, which is designed with a simple storyline that is easy for children to understand and adds innovation in the form of a roll technique which aims to foster children's curiosity and provides experiences in reading storybooks. Reading picture story books with roll innovations containing physical science content in collaboration with hands-on practice will greatly optimize the provision of knowledge to children. Supporting media that can be collaborated with science drama activities is still very rare so that the development of this media is expected

to be one of the media that can meet these needs. With the creation of this media roll book, it is expected to be able to provide new references and add learning media about physics for children. In the future, the researcher hopes there will be more research can produce science learning media, especially physics content for an early age is interesting, meaningful, and fun.

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