

Development of Learning Media for Early Childhood Based on the Mechatronics System

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ABSTRACT

Learning media can be used as tools or intermediaries to help early childhood play and receive understanding of new concepts. Mechatronic-based learning media has a role in improving early childhood literacy skills. This learning media development aims to produce an innovative early childhood learning media and to determine the feasibility of developing learning media for early childhood using the mechatronic system. This research was conducted using the Research & Development (R&D) method using 4D development procedures namely; Define, Design, Develop, and Disseminate. Through learning technology in the form of mechatronic system-based learning media, it has changed the way young children learn and interact with their environment. Learning technology innovations like this must continue to be developed to support the advancement of children's education in Indonesia.

Keywords: *Learning Media, Early Childhood, Mechatronics Systems.*

1. INTRODUCTION

Indonesia as one of the largest consumer electronics in Asia. Reporting from the business page paragraph in 2019 that Indonesia is a new paradise for world electronic producers so that the world's electronic producers are busy moving factories to Indonesia. This of course causes many problems in the world of children, starting from changes in the character and social behavior of children as well as children's motor skills, both fine and gross. This is due to lack of supervision or parental controls will the electronic media were given to children, including the use of electronic based media serve as a medium of learning for children. This is because the demands of the globalization era with the development of information technology can be used for learning [1].

In line with the current development of Science and Technology, the learning process is not sufficient by utilizing simple learning resources and learning media such as sketches, pictures, boards, books, etc. which are visual and conventional in nature, but enriched with modern electronic media and audio-visual such as computers, laptops, cellphones, and other things [2]. The impact of technology that is increasingly developing for children's education certainly needs to be followed so that it is relevant to the environmental

situation and the times faced by children, but the impact on children's development must still be considered. It should be endeavored that the technology used in children's education has a positive impact on students.

Speaking child-related issues, it is understood that children age early began to develop concepts and skills from infancy to early childhood, this is the basic concept that was developed early childhood during the early days of school [3]. Aspects of child development ages early is a reference that will form the character and personality of children, as we know that a child is an accomplished impersonator. Therefore, in the learning process of children aged early media needed a good and does not damage the character and behavior of the children themselves. The learning process of early childhood will also be interesting and fun if it is done with teaching aids or what is called learning media [4].

Learning media is a tool to help or intermediary that can not be released from early childhood learning as learning media can overcome the limitations of experience possessed by younger children. In addition, the media in learning is any form of communication that can be used to convey a message or information from sources on students who bertujuan in order to stimulate their thoughts, feelings, interests and concerns of children to participate in learning activities [5]. For this

reason, the development of media in learning aged children is a very important right and is needed by students. The media can represent what the teacher is unable to say through certain words or sentences so that students can more easily understand the material [6]; [7]. The media used should be that mud ah used were used , safe to use and durable so that it can be used for longer periods of time [8].

The role of the teacher in selecting and determining the appropriate learning media to support early childhood learning is also very influential on the success of early childhood education. Vice versa, the selection of instructional media that is not appropriate for children ages early will also have a negative impact of early childhood education. In choosing instructional media requires some planning and consideration, including: the teacher feels familiar with the learning media so that he chooses the media, the teacher feels that the learning media can describe it better than himself, the media can attract student interest and attention [9]. Regarding the use of learning media, it needs to be done appropriately in order to overcome the passive attitude of students and provide opportunities for students to experiment and explore widely on these learning media [10]. Media can also be used to convey certain parts of learning activities, provide reinforcement and motivation to students and overcome the limited experiences of early childhood [11]; [12].

Making the medium of learning for children ages early is an activity which is the ability memadahi requiring specific requirements such as knowledge of child development and creative skills to make the media so that the tool of educational games truly effective in developing aspects of early childhood development [13]. This study seeks to develop mechatronic system-based learning media . The development of learning media that involves this electronic system is an effort to develop contextual learning that is in accordance with the times that children are facing. There are several challenges in contextual learning that can still be identified. First, support for contextual learning requires an infrastructure for contextualization with a strong technological foundation in the field of context-aware systems [14]. Second, methods for analyzing and designing special tools that are tailored to a situation. Third, seen from the perspective of human computer interaction, new methods of interacting with media and the ubiquitous and contextual learning experience need to be investigated [15]. Finally, and most importantly, the pedagogical model behind contextualized learning must be more defined, best practices for implementing it should be further developed [16]; [17], and new ways of integrating contextualization. media in existing learning scenarios must be found. So, in this matter we want to develop a mechatronic-based learning media.

2. METHOD

This research uses the method of research and development of a learning media based on mechatronics system that is model 4D. The main Stage 4-D development model is Define, Design, Develop, and Disseminate [18]. The 4D development method is not much different from the other product development methods, but this development procedure is shorter because the resulting product is not too risk and the system impacts are limited to targeted students. The define stage; this research conducts the need for the development of this learning media, namely the development of a media learning for early childhood based on mechatronics system that also integrated the local stories of Malay, Riau. In the design stage, this research has made the product initial (prototype) or product design. In addition, this stage is also carried out activities with activities to prepare framework or design of the learning media based on mechatronics system. In the developing stage, the research in this stage is divided into two activities: expert appraisal and developmental testing. Validation by learning media experts, where all advice given by experts is used to improve the quality and eligibility of the learning media that has been made. Furthermore, trials or implementation tests for the learning were developed. The disseminate stage is the deployment step of the learning media developed, namely making a guidebook for the use of mechatronic-based learning media and presenting the results of media development in scientific forums or seminars.

3. RESULTS AND DISCUSSION

The development of education for aged children in Riau, Indonesia still has several obstacles related to the quality of education, including limited access and infrastructure for education. Human resources in Riau have great potential in the field of education. Limited access to infrastructure in education makes children lack motivation and desire to study science, especially technology in the digital age. The role of learning media is very important in the learning process as communication and takes place in a system, so learning media technology occupies an important position as a component in the learning process. Developing media - based learning these mechatronic systems will be used as props in the process of early childhood learning in school. In increasing the optimal productivity and creativity of teachers and also influencing the development of students, especially in the delivery and presentation of learning material in the teaching and learning process can use learning media. Media plays an important role in the learning process of early childhood and can be used as a vehicle to get closer to teachers' perceptions and understanding of children's comprehension [19].

Results of a preliminary study in the field, see the low kemamp uan teachers in the development and supply of technology media learning using mechatronics for children age prematurely. This condition is a major reason in this study because it has great potential in advancing media technology in every institution of learning mechatronics especially the education of children of age early in Riau. Learning carried out by the teacher in the absence of mechatronic-based learning media technology shows that students' motivation at the time of learning of students is lower, such as not concentrating, talking with friends, not listening to the teacher, and even some children are sleeping and running around when the teacher explains the learning material . This condition has an impact on the learning process to be less conducive and ineffective. Seeing poor condition, researchers try to bring new innovations on the concept of technology media learning using mechatronics for children age prematurely. The emergence of mechatronic learning media is expected to help teachers be more creative and effective in delivering subject matter to their students, so that messages are easier to understand, learning is more interesting, and also more fun for students who are still at an early age.

Mechatronics-based learning media is an integration of controlled mechanical and electronic systems to be used in products and production processes. Currently, the term mechatronics is considered a separate field, although it cannot be separated from various others. Mechatronics synergizes with mechanical engineering science and technology, electronic engineering, and informatics engineering to design, create or produce, operate, and maintain a system to achieve the goals to be achieved. The use of technology (mechatronics) in children aged early as suggested by experts; that children naturally learn about their environment through observation, in this case technology (mechatronics) offers easily accessible facilities to expand the area and reach of exploration [20].

The importance of the use of technology (mechatronics) for children aged early has been done in some developed countries like the United States that provides policy recommendations that motivate parents to use media technology together with their children. The study used a nationally representative sample of the United States of 2,326 parents of children aged 6-8 years. This study examined the factors associated with parent-child relationships across six types of media, namely books, TV, computers, video games, tablets, and smartphones. The implementation of the research results is that parents agree to motivate the joint use of media technology [21].

Mechatronic-based instructional media technology uses a variety of pictorial stories (not moving) according to the theme that the educator will use when teaching

and the text is drawn, facilitating children to get to know various ideas. The presentation of this mechatronic-based learning media includes a picture in the form of an interesting story, namely the local Malay folklore of Riau. It is hoped that this new innovation can be used by educators, the community, or PAUD institutions that need this learning media.

At the design stage of this mechatronic media consists of two processes, the first is the process of making frames and furniture from mechatronic media and the provision of pictures in the predetermined stories, namely the tuna fish story, the catfish story, the daughter story seven and the princess glass story. The theme of this mechatronic media background is a rainbow theme and the second is the process of designing a remote control that will control the storyline on the mechatronic media that has been created.

This mechatronic-based learning media uses a pulley system, which is rotating according to a predetermined flow. In each flow will be made slide by slide. On each slide, each picture and story is displayed. The theme of the story in this mechatronic media is the story of tuna fish, the story of catfish, the story of the daughter of seven and the story of the daughter of the glass mayang. In each story, each picture and sound has been prepared according to the text provided on each slide. The background of this mechatronic media is a rainbow shape that is made directly with three dimensions. To control this mechatronic media, a remote control is used which has been provided to control the storyline on each slide.

The remote control used to control the mechatronic media consists of two buttons and has their respective functions, for more details, it can be seen from the following table:

Table 1. List of Hardware for Mechatronic Media

Function Code	Unit	Function Name
Arduino Uno	1	Arduino UNO Atmega 328
<i>Easy Driver</i>	1	Stepper motor controller
<i>Motor stepper</i>	1	Media drive
<i>Remote RF 315</i>	1	Media forward and backward controller

Table 2. List of Software for Mechatronic Media

Software	Information
Operating system	Window 7 Profesional
Aplication Language C	Arduino <i>Software</i>

In the process of making mechatronic-based learning media, it has several stages, namely: 1) Forming a

mechatronic media frame using angle iron; 2) Installation of plywood on the iron frame; 3) Installation of the driving motor on the pedestal provided on the frame; 4) Installation of the motor drive installation; 5) Installation of image media on the driving rollers; and 5) Combining the motor with pictorial media.

In the next process is the installation of a mechatronic remote control on the learning media that has been developed, while the stages are as follows:

1. Prepare the following tools:
 - a. 2 PIR sensors (which have NOT been modified).
 - b. 1 infrared sensor.
 - c. 1 piece of remote control RF 315 key chain.
 - d. 1 6 pin socket.
 - e. Other accessories (4 ribbon cables, etc.).
2. Assemble and connect all sensors on the port that has been prepared
3. After everything is properly connected, place all the sensors in sequence on the mechatronic media frame for easy identification.
4. Connect the plug to the 220V PLN socket and turn on the driver and wait 1 minute to make sure the sensor is ready to operate.
5. Test the assembly and connection of all sensors by moving them with the remote control
6. Remote control interrupt:
 - a. Up button (A): the image media will move upwards.
 - b. Down button (B): the image media will move downwards.
 - c. Auto mode button (C): the image media will move as a whole
 - d. Stop button (D): the image media will stop



Figure 1 Remote Control of Mechatronics Based Learning Media

Mechatronics-based learning media is used as a medium in the teaching process of early childhood so

that holistic learning becomes more fun and helps children develop aspects of language, character and moral, physical motor, socio-emotional, and art from early childhood so that their development runs well . The success of a child's learning age early influenced by many factors, including the medium of learning [22]. The ways to use mechatronics-based learning for early childhood are as follows:

1. Place the media in front of the classroom and then the media is turned on.
2. Introduce the theme that will be conveyed to the child.
3. Move the desired media using the *remote control* .
4. Tell me the picture on the selected *slide*
5. After all the pictures are told, the teacher repeats the story as a form of reinforcement.
6. Pick a few kids to come forward and try this mechatronic medium.
7. Children are asked to press the *remote control* button and tell the picture they have chosen.
8. Closing, the teacher asks the students again about the theme when it is a form of reinforcement to children.



Figure 2 Mechatronics Based Learning Media for Early Childhood



Figure 3 Implementation of Learning Media for Students

The picture above shows the form and process of implementation in the classroom of children's learning media age based early mechatronics has been developed. It can be seen an innovation in the development of learning media and its feasibility is

known as a learning medium after being tested in the learning process.

4. CONCLUSION

To recognize about analyzing and designing special tools that are adapted to a situation of making learning media for early childhood using this mechatronic device in early childhood education institutions, the prototype made by researchers can be used as a medium of learning well. Likewise to perform sensor analysis and repair of the mechanical work system or the motor driving the media. To get good media results from the mechanical work process and sensors of this learning media, it is influenced by the quality aspect, as well as the use of appropriate tools, so in making learning media good media is needed and does not have an effect on the physical and mental safety of the students themselves. . During the trials conducted, the results obtained were also influenced by the shape of the media itself. Lastly, most importantly the pedagogical model in contextualized learning, best practices in applying it should be further developed and new ways to integrate media contextualization in existing learning scenarios .

The process of making media based on mechanics and electronics (mechatronics) in the future can make it easier for educators and students to carry out the learning process where some challenges in contextual learning can still be identified. Contextual learning support requires an infrastructure for contextualization with a strong technological foundation in the area of software systems, methods for analyzing, and designing specific tools that are adapted to a single situation. It can also be seen from the perspective of human computer interaction that new methods of interacting with media and learning experiences are ubiquitous and contextual need to be investigated.

AUTHORS' CONTRIBUTIONS

First author as designed the analysis and wrote the paper. Co-authors as contributed data or analysis tools and performed the analysis.

ACKNOWLEDGMENTS

Conflict of Interest; Authors declares that there is no conflict of interest within this research, publication paper, and research support. This research publication supported by Universitas Riau, Pekanbaru City, Indonesia.

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