

QR Code Card Media on Science Learning to Overcome Misconception of Elementary School Student

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ABSTRACT

The education development has entered the Literacy Acceleration era in The Knowledge Age. Learning media innovation plays an important role for students in the development of technology as a learning medium, particularly in the usage of technology-based learning media. During the COVID-19 epidemic, many problems have arisen connected to online learning, one of which is student misconceptions, especially in science material, in the high class of Keboromo elementary school. This study aims to describe the need for developing QR Code-based learning media used by educators and students today, which can be used at home to support students' understanding and overcome misconceptions. According to Borg & Gall, research and development involves various processes. This study is limited to the first stage, which is the research and information collecting stage. The research subjects for this need analysis were 3 educators and 8 students representing one elementary school, namely Elementary School of Keboromo. Data collection techniques in this study using interviews. An interactive model is used in the data analysis technique, including processes such as data reduction, data presentation (data display), and conclusions drawing or verification. The findings of this study show that in order to overcome misconceptions in science subject learning, educators and students require technology-based media designs that are simple to use and accessible via smartphones or other devices. As a result, students will be more efficient with their time, more practical with their knowledge, and the material students receive will be more focused.

Keywords: Learning Media, QR CODE, Misconception.

1. INTRODUCTION

Literacy Acceleration in The Knowledge Age, requires students to be skilled at utilizing and mastering technology, both in learning and in everyday life. Therefore, the role of learning media innovation for students related to the development of technology as a learning medium is very important. Media is a tool that is used to introduce certain materials so that learning becomes focused and well conveyed [1]. AECT (Association of Education and Communication Technology) 1997 in [2] states that media are all forms and channels used to convey messages or information. The learning media is a creative media used in providing subject matter to students so that the teaching and learning process is more effective, efficient, and fun [3].

During the COVID-19 pandemic, learning that should have been taught in a classroom situation was conducted online or without direct teacher assistance. Many problems have occurred related to online learning during the COVID-19. One of them is the misconception experienced by students, especially on the science content in the high class of SD Negeri Keboromo. If students learn online or without direct teacher guidance, they are more likely to develop misconceptions, resulting in the teacher's inability to solve these problems.

For the Indonesian people, the industrial revolution 4.0 has become a challenge in terms of performing out technology-based aspects of life, particularly in the field of education. Because of the rapid advancement of technology, educators must constantly update their knowledge and expertise. According to [4] the current of technological development is several times more

advanced than the current of change in the education system. Related to this, of course, brings changes that affect the educational paradigm. Education is one part of human life in the development of science and technology.

Students are said to have misconceptions if they can explain certain scientific concepts, but what is conveyed is not in accordance with scientific concepts accepted by scientific experts in their fields. According to [5] elementary school teachers are one source of student misunderstandings so that their understanding needs to be identified. However, the process of identifying the science concepts understandings is still small and only on certain materials so that these students can answer questions with high confidence even though it is still not right. According to research undertaken by [6], misconceptions about evolutionary material, mainly material in science learning, arise as a result of the teacher's previous incorrect understanding, which then has an impact on the students who are taught the subject. There is a demand for media that teachers may utilize to present science curriculum material so that misconceptions are reduced. [7] stated that in science learning, misconceptions are wrong ideas or ideas that are often understood by students, which are contrary to generally accepted scientific consensus.

The poor level of students' initial understanding related to the learning materials they understand can be described as things that can interfere with learning and cause students to fail in understanding the right scientific concepts. According to [8,] students' prior knowledge or understanding can be changed by incorporating new knowledge into their learning experiences, which can then be successfully transformed such that misconceptions are avoided. Because the comprehension level acquired by elementary school students is largely dependent on real life experiences, it is essential to employ real rather than abstract media when learning. Based on observations that the implementation of online learning is lacking in media, schools must create media that can be used in a variety of ways to support online learning. Reinforced by the statement [9] that the success or failure of a learning depends on the teacher implementing and the content of teaching materials that are arranged and systematic delivery.

According to Fowler and Jaoude in [10], Misconception is defined as an incorrect understanding of a concept, incorrect use of the concept of a name, incorrect classification of examples of concepts, doubts about various concepts, inappropriate connecting of various concepts in a hierarchy arrangement, or an excessive or unclear generalization process of a concept. According to [11] the main sources of misunderstanding among students are caused by the students themselves,

the teacher, books, context, and the way the teacher teaches.

The following is a summary of research on the development of instructional media and misconceptions. First, research by [6] on curriculum statements and textbooks is considered an important supporting tool for teachers, especially during the curriculum innovation period. Second, research by [7] on efforts to identify and overcome student misconceptions is an important part of teacher competence. Third, research by [8] on how to leave misunderstandings or misconceptions. Fourth, research by [12] on the use of information technology, especially QR codes in education, is still lacking. Fifth, research by [13] on MAN 2 learning model still uses the bookkeeping method which is then inputted in the spread sheet software. This method makes the school less optimal in managing existing assets. Sixth, research by [14] on exploring and analyzing teaching methods and processes that incorporate Quick Response (QR) codes and mobile devices into the classroom. Seventh, research by [15] on students provided insight into their use of Quick Response (QR) codes and mobile devices to assist with math homework efforts. Eighth, research by a study conducted with 14 students, all students showed a positive view of the QR code prepared for mathematics courses and 67% of the students stated that there was a significant increase in the value that students got after using the QR code.

Based on previous explanation, it was discovered that students in schools, particularly students at SD Negeri Keboromo, continue to struggle with misconceptions about science lesson material and a deficiency of learning media, requiring the development of learning media to solve these challenges. This research is an initial part that aims to analyze the need to develop learning media that can overcome the problem of misconceptions in science content learning by using a *QR Code*. The formulation of the problem in this research is as follows: 1) How is the school's need for the development of learning media, 2) How does the school's description of learning media handle SD Negeri Keboromo students' misconceptions regarding science lesson, and 3) How is the design of the product which will be developed to meet the needs of schools in overcoming the misconceptions of SD Negeri Keboromo students towards learning science lessons material.

2. METHOD

This research is an early research which is included in the development stage of the Research and Development method (*Research and Development*) Borg & Gall in [16]. This research is limited to the first stage, namely the research and data collection stage (*Research & Information Collecting*). The research subjects for this needs analysis were 3 educators and 8

students representing students from high grades in elementary school, namely SDN Keboromo. Data collection techniques using interviews and data analysis techniques. The data analysis method used is the interactive method by Miles and Huberman (1992) [17] with steps of data reduction (*data reduction*), data presentation (*data display*) and drawing conclusions or verification (*conclusion Drawing/Verification*). The validity of the data used a validity test with the data source triangulation method. Triangulation of data sources is to explore the truth of certain information through various methods and sources of data acquisition. For example, in addition to interviews and observations, researchers can use participant observation, written documents, archives, historical documents, official records, personal notes or writings and pictures or photos [18].

3. RESULT

Researchers conducted interviews with 3 educators regarding the use of learning media currently used and what kind of media design is needed by educators in overcoming misconceptions that are often encountered by students when learning science content. The first educator stated that currently he was using thematic book media or maestro series books, but it was limited to delivering material, as for the development of the media needed; technology-based media that were easy to use and obtained by educators and students, especially those containing materials and examples, which can be visualized well and interestingly related to the content of science learning. Furthermore, for the next 2 educators, they use the media of books and pictures for the delivery of material, as for the design of the media needed is technology-based media that can be accessed via *smartphones* where the media includes materials and examples that are clear and easily understood by students.

Based on what was explained by the educators, students usually experience misconceptions on certain materials. In accordance with each class taught, the teacher answered as follows:

1. GKIV : “In the fourth grade that I teach, students who experience misconceptions are on the material of animal metamorphosis and also the form and function of plants. In animal metamorphosis, to become a butterfly, it must go through the stages of an egg, a caterpillar, a cocoon, and a butterfly. However, there are children who understand that the butterfly appears after the egg hatches, not from a true stage of metamorphosis. Furthermore, in the matter of plant form and function, children understand that all plants with fibrous roots are monocots, even though not all fibrous plants are monocots. Dicotyledonous plants also have root fibers, but they are few in number and have different shapes.

Dicotyledonous plants which have fibrous roots are usually plants that are propagated by cuttings or grafts”.

2. GKV : “I once met a student who had a misunderstanding about heat transfer materials. The child realizes that insulating objects or objects that cannot conduct heat are assumed to conduct heat as well. When I asked the child about it, he said that when wood is burned, it heats up the ends but not too much, therefore the child thinks that wood conducts heat as well. There are also children who have misconceptions about food webs and food chains. The child does not understand the distinction between a food web and a food chain and believes they are the same. Food webs, on the other hand, are made up of interconnected food chains. I have given an example and I explained the difference, but the child said that it was the same thing because food chains and food webs both have producers, consumers I, II, and so on. Furthermore, I also found children who thought that all fish breathe with gills, whereas there are fish mammals that breathe with lungs and give birth instead of laying eggs.”

3. GKVI : “So far, I've only discovered electrical materials, specifically series and parallel electricity. Children have difficulty experience distinguishing between the two and are frequently confused when demonstrating the use of the two types of energy.”

According to the three educators above, the development of science content learning media is critical, with a description of technology-based media design that is easy to use and accessible by educators as well as students via smartphones or other devices, in order to overcome misconceptions that students frequently encounter in learning science content. Materials that often occur with misconceptions are also presented in the interview which will later be used as a reference in media development.

Then the researcher continued to interview with 8 students about the misconceptions that are often experienced and what kind of media design they need in order to minimize the occurrence of misconceptions.

1. PD1IV : “My teacher once told me that butterflies are born from caterpillars, not eggs. Because I like to play on smartphones, if at all possible, the material should be available on cellphones rather than in books. It is not interesting to read a book that is difficult to grasp because the colors are blurry. It is significant, in my opinion, because you can play HP while playing other activities.”

2. PD2IV : “I've had it happen to me before, and if I don't understand something, I typically question the teacher. Then, after some explanation, I understand a little more. I prefer to absorb material in the form of video games rather than reading books with a lot of text. Media that is similar to a game, in my opinion, is

significant since by playing, the material taught is usually more understandable and easy to recall.”

3. PD3IV : “Yes, I sometimes become confused when something is explained online and I don't understand it. When there is a science lesson that covers it, media that uses school environment material such as vegetables, plants, stones, and others is crucial. The media can be around the house if it's online; if it's not, it's via mobile, which is more fun.”

4. PD1V : “Yes, sometimes, for example, when the teacher discusses a science subject, I don't understand something and am even more confused after the teacher explains it. Because I initially misunderstood it, then after it was clarified, I became even more confused. The media that surrounds us, like nature, has the ability to influence our lives. Learning media is essential because it makes learning more interesting and relevant.”

5. PD2V : “I once believed that wood could transmit heat during a scientific class about heat since I had a spatula at home with a hot, but just warm, end. When the teacher stated that the wood was difficult to conduct heat and I questioned why it still felt hot or warm when I fried with a spatula, I assumed the teacher was lying to me. Using media with individuals in our surrounding location, such as the environment, then I have a cellphone, so it's crucial to use a cellphone.”

6. PD3V : “Never. But in the past there was a friend of mine who was told but was annoyed and didn't understand. Good media for science is media that is in accordance with learning materials, it can be real object media or media that can only be seen as video examples. Learning media is important so that it is easier to understand the material.”

7. PD1VI : “There has never been a misinterpretation of the science material I have studied. I just had trouble distinguishing series and parallel electricity in yesterday's electricity class. The material was very difficult, there were questions that were asked to work on a series parallel electric circuit by drawing the circuit, and so on. The most important media for science lessons is when I practice directly, rather than being explained or the teacher is lecturing. I can catch the material more if I practice it directly, like when I practiced grafting and planting chilies yesterday. The teacher also explained the material while practicing and it was easier for me to understand. Then if I practice on my own, it is easier for me to understand flora and fauna through nature.”

8. PD2VI : “Yes, I think the electricity class is the most challenging at times. Electrical circuits in series and parallel, which are occasionally reversed, are extremely difficult for me to understand. Easy-to-use media that is consistent with the content, as well as content written in a simple language. It is crucial, in my

opinion, because without it, the information is abstract and difficult to comprehend.”

From the statements of 8 students, all of them stated that they often experienced misconceptions when learning science content, especially during the *COVID-19* pandemic. These eight students argued that they would be happier if the material was presented in the form of technology-based media that they could use on *smartphones*, because the majority of students were more interested in reading on *smartphones* than reading in thematic books or maestro books.

4. DISCUSSION

According to the findings of the interview, students at SD Negeri Keboromo still have misunderstandings about science material, which are critical to solve using the school's media, such as thematic and master books. Educators have not been able to overcome the challenges of misconceptions experienced by students throughout the pandemic, despite using online learning. The only learning resource is a thematic book titled "*Maestro Buku Pendamping Seri tematik Terpadu*" that can be utilized as teaching materials. Students are simply assigned the duty of creating handicrafts, which is another skill-based learning.

As a result of these issues, Educators explain their needs in relation to the development of technology-based learning media that is easy to use and accessible, as well as clear materials and examples in science topic learning. This is supported by Gerlach and Ely in [19] saying that the media, if understood in broad terms, are humans, materials, or events that build conditions that enable students to acquire knowledge, attitudes, or skills. More specifically, understanding in the learning process tends to be interpreted as graphic, photographic, or electronic tools for capturing, processing, and rearranging visual or verbal. *QR Code*-based learning media is considered to be one solution to overcome this.

According to [20] the benefits of using *QR codes* are as follows. 1) *QR code* connects students with *online* content without having to enter a *URL*. 2) Through *QR code*, students can get a way to access unlimited information. 3) *QR codes* can store hundreds of times more information than *barcodes*. *QR* is *barcode* that is widely used for various purposes. 4) *QR code*, students can link to multimedia learning content. This is also in line with research by [15] stating that in this study, students shared their experiences with using Quick Response (*QR*) codes and mobile devices to help them with their math homework. This *QR code* is directly linked to the video instructions associated with their unit on the fractional algorithm and is hosted on *YouTube*. In particular, through focus group interviews, the students identified many strengths associated with conducting this research.

According to the data presented above, high school students at SD Negeri Keboromo are still struggling to overcome misconceptions in science learning due to online learning constraints. After observations and interviews with research subjects, it was found that educators and high-class students still found and experienced misconceptions related to science learning, thus requiring the development of technology-based learning media with the descriptions mentioned above.

Especially during the current *COVID-19*, *QR Code*-based learning media will be developed by researchers in an effort to overcome misconceptions that often occur. This is supported [14] which explains that QR codes can contain information such as text, URL links, automated SMS messages, or almost any other information that can be embedded in a two-dimensional barcode. This encoded data can be decoded by scanning the barcode with a camera-equipped mobile device and QR reader software. In contrast to bar codes or *barcodes* which only store information horizontally, *QR codes* can store text information or data both horizontally and vertically. Therefore, the amount of data that may be stored is significantly greater than the capacity of the *barcode* [21]. In addition to the Maestro book teaching materials, students need additional media to overcome the misconceptions experienced by students.

This study aims to create a learning media from the development of *QR Code*. *QR Code* printed on the card is a copy of the material link that can be accessed by scanning using a device. As a result, students will be more efficient with their time, more practical with their learning, and the material presented will be more focused. According to study, student learning outcomes via QR Code learning on the material periodic system of elements are better than student learning outcomes from traditional learning. [12].

QR Code stands for *Quick Responses Code*, which is a code that is used to access things quickly. The use of *QR Code* has been widely used in educational purposes such as being used to label school assets, library books, and other matters related to school administration [13]. The use of *QR Code* as a learning media is still rarely done because it must be assisted with a device to access it. However, in online learning that is currently being carried out, most parents have facilitated devices so that future research will not be constrained by student ownership of the device.

The use of *QR Code* as a learning media is very appropriate to overcome the misconceptions experienced by students. Based on a study conducted with 14 students, all students showed a positive view of the *QR Code* prepared for math courses and 67% of the students stated that there was a significant increase in the value that students obtained after using the *QR Code*. Students give reasons that the material being taught can be directly accessed to find the required

information through the *QR Code* without having to ask friends or teachers [22].

5. CONCLUSION

Based on the results of the analysis of interviews conducted with 3 educators and 8 students at SD Negeri Keboromo, the researcher can draw several conclusions.

1. In order to overcome misconceptions in science content learning, educators and students require technology-based learning media designs that are simple to use and can be accessed by educators and students on smartphones or other devices.
2. The design description of the required media includes materials and examples related to learning science content which are visualized in an attractive and clear manner, easy to use and understand.
3. The design of the developed media is a *QR Code-based* science content learning media. *QR Code* printed on the card is a copy of the material link that can be accessed by scanning using a device. Therefore, students will be more efficient with their time, more practical with their learning, and the material presented will be more focused.

AUTHOR'S CONTRIBUTION

The author 1 as a researcher in the field to obtain as much data and information as possible, analyze the data and being the author of this article as well. Author 2 as a supervisor and reviewer of articles as well as an expert validator in research.

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