The Effect of Stream-Based Teaching Materials Using Android on Students' Problem-Solving Skills and Religious Attitudes

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Abstract: This study aims to develop water teaching materials using android on students' problem-solving skills and religious attitudes with a learning model of the Science, Technology, Religious, Engineering, Art, and Mathematics (STREAM) approach science subjects. The experimental method carried out by R and D uses the 4D design (Define, Design, Develop and Disseminate). The research data were collected and analyzed in the form of quantitative descriptive from the results of the students' pretest and posttest. This research was conducted through a google form by distributing a questionnaire, which was given to students with 50 respondents and five science teachers who had used STREAM-based water teaching materials using android. The results of the study, the average percentage of problem-solving skills with N Gain was 73% with a high category, which means that the application of learning materials based on android is proven to improve student learning. Assessment of religious attitudes in integrating material with the verses of the Quran is very good. This study's conclusion shows that learning using STREAM-based teaching materials using android is statistically very significant, proven to be effective in improving students' problem-solving skills and religious attitudes to water material in online learning during the current pandemic.

Keywords: STREAM; android; problem-solving; religious attitude; online.

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INTRODUCTION

The world is currently faced with multidimensional problems due to the outbreak of Covid-19. Almost all aspects of life in various fields have been affected, such as education, social, economy, and tourism. In the field of education globally, this tragedy has had an enormous impact, so that it presents its challenges for educational institutions (Ayuni et al., 2020; Bao, 2020; Dewi, 2020; Dhawan, 2020; Fitriyani et al., 2020; Hodges et al., 2020; Sadikin & Hamidah, 2020; World Health Organization, 2020). Learning in schools during a pandemic must be conducted online. School managers, teachers, students, and also parents must change their learning patterns to a distance or online digital learning system, which is known as e-learning. Almost all school activities in various countries are eliminated and diverted from their homes so that the learning process continues. About 1.723 billion students have been affected due to school closures in response to the pandemic,

which has caused the quality of learning in students to decline (Nasir, 2020; Sahu, 2020).

An internet network with accessibility, connectivity, flexibility, and ability in online learning to generate various types of learning interactions is digital technology learning that makes it easier for students and teachers even though they are in different places. To access information in online learning, supporting devices such as smartphones or android phones, laptops, computers, tablets, and iPhones are needed, which can be used anytime and anywhere so that teachers and students can interact (Bao, 2020; Dhawan, 2020; Hodges et al., 2020; Nasir, 2020). Changes in learning and teaching patterns today will not be separated from the teacher's role. Teachers' readiness and confidence are the primary keys to dealing with teaching and learning activities (Ayuni et al., 2020; Roza et al., 2019; Zubaidi, 2020) so that in any condition, teachers who have good readiness in learning will improve their quality. Besides, it will help improve students' learning outcomes.

The use of mobile technology in online learning in educational institutions is convenient to support, including distance learning goals. Thus, teachers are required to follow the times in the digital era. ICT is an essential tool to integrate into the learning process to develop learning media and multimedia. Teachers can arrange materials to be taught to students using software assistance in the form of a combination of various media into an interactive multimedia learning device. Innovations related to learning models are needed in the learning process to realize 21st-century learning. One of the learning models for problem-solving skills and religious attitudes to students is the STREAM (Science, Technology, Religion, Engineering, Arts, Mathematics) approach.

Higher-order thinking skills must be provided to students in solving problems because they are closely related in everyday life in this 21st century. This problem-solving ability is needed so that students can compete globally (Dewi et al., 2017). Mustofa and Rusdiana (2017) found that current students'

problem-solving skills are still unsatisfactory and below average. Students' lack of skills in solving problems can be overcome by training students to improve their problem-solving skills. Various researches on how to improve students' skills in solving problems have been carried out by providing various innovative learning methods and models (Hung, 2008; Yu et al., 2014). The indicator aspects of problem-solving skills are defining and examining problems, planning and implementing solutions made, and evaluating.

Religious attitudes which are used as the basis of national education are part of character education. The function of national education in the context of developing the intellectual life of the nation is to develop capabilities and shape the character and civilization of the nation with dignity. The development of students' potential as the goal of religious attitudes is to become democratic and responsible citizens and people who believe and fear God Almighty, have a noble character, are healthy, knowledgeable, capable, creative, independent (Abidin, 2014). The indicators for assessing students' religious attitudes developed in this study based on the 2013 curriculum are obeying worship, behaving in gratitude, praying or giving greetings before and after carrying out activities, and being tolerant.

Based on the description above, students' lacks of skills in solving science learning problems require alternative solutions. Students' religious attitude internalized from family, school, and society in their daily lives is the foundation in fostering children's habits in implementing religious values. The use of learning models and media that can train students' skills to solve problems and religious attitudes is an alternative solution in learning. The purpose of this study is to develop STREAM-based water teaching materials using android-based interactive multimedia to improve students' problem-solving skills and religious attitudes in online learning.

STREAM in research integrated into water teaching materials is in the form of

indicators for the domains of Science, Technology, Religion, Engineering, Art, and Mathematics. Science in the concept is the mastery of the water cycle concept and water's role in life. Technology is developing a filtration technology product to produce clean water. Religion appears in the concept of water that can be used for ablution. Engineering is developed with an activity plan to solve dirty water that can produce clean water by designing a filtration device. Domain art appears in plants (flowers) stored in water that has been given red, yellow, and blue colors in each location. Mathematics is calculating the discharge of clean water produced in the filtration process. PowerPoint interactive multimedia used in this study is integrated into Android devices. The teaching material developed refers to the indicators of students' problem-solving and religious attitudes in mastering the science learning process concept with water teaching materials.

METHODS

The research subjects were conducted on 50 students of Madrasah Tsanawiyah in Sukabumi. The selection of students to be research subjects used purposive sampling, which refers to Arikunto (2017). The development in designing and making android-based water teaching materials in this study uses the Research and Development (R & D) method with a Four-D development design (4D) which consists of 4 stages; Define, Design, Develop, and Disseminate. This model has been widely used by several researchers, including Thiagarajan and Sivasailam (1974), Dewi et al. (2019), and Khasanah et al. (2020).

The data were collected by measuring students' problem-solving skills and religious attitudes online. The measurement of the problem-solving skills test given to students was in the form of multiple-choice questions as many as 20 questions. Each question has a score of 5, so the maximum score is 100. The test is carried out online using Google Form with five aspects of problem-solving skills indicators according to Mourtos et al. (2004) and Polya (1973): defining and examining problems, planning and implementing solutions made, and evaluating. This test was

tested with the one-group pretest-posttest design technique, which refers to Fraenkel et al. (2012). The scheme is shown in Table 1.

Table 1. Scheme of *The One Group Pretest-Posttest Design*

Pretest	Treatment	Posttest
T_1	X	T_2

Through this pretest-posttest, measurement of skills is carried out before and after treatment of students' problem-solving skills. T1 as a pretest is carried out before students are given treatment, X as Treatment is given through STREAM-based water learning materials using android, and T2 as a posttest carried out after the sample was given treatment.

The residual value is normally distributed or not, then a normality test is carried out so that the significance value in the Asim column can be found. If the residual value is normally distributed, it can be done by using the paired sample t-test. However, if the residual value is not normally distributed, the mean significant difference test can be done with a non-parametric statistical test, the Wilcoxon test (George & Mallery, 2018). The basis for making research decisions is if the Sig p-value <0.05, then there is a significant difference between the value of problem-solving skills in the pretest and posttest data; however, if the value is Sig. $P> 0.05$, so there is no significant difference between the values in the pretest and posttest data. After the data was declared normally distributed, an N-Gain test was conducted by dividing the reduction between the posttest score and the pretest score divided by the maximum score minus the pretest score. Likewise, religious attitudes show an increase in integrating material with the verses of the Qur'an so that it is better.

The effectiveness of Android-based teaching materials was calculated based on the students' feedback. Data collection of problem-solving skills are in the form of quantitative results from learning daily test scores. Data in the form of values are then analyzed by determining N-Gain based on

Hake's (1999) category, as shown in Table 2.

Table 2. N-Gain Interpretation

N-Gain (%)	Interpretation
(g) ≥ 70	High
70 > (g) ≥ 30	medium
(g) < 30	Low

The research steps were carried out in several stages: planning, implementation, and final. The planning stage is conducting curriculum analysis, including analysis of core competencies, basic competencies, learning indicators, and learning objectives, and compiling completeness of learning instruments and research instruments. The implementation stage includes a pretest, the implementation of learning using android, then ends with a posttest to measure students' problem-solving skills. The final stage is data analysis, discussion, and drawing research conclusions.

The religious attitude test given to students is based on the 2013 curriculum, by giving the assignment to integrate science about water with the Al-Quran verses. Students are expected to be able to distinguish and use holy water. Data on students' religious attitudes were collected using observation sheets to observe students' abilities in STREAM-based water teaching materials using android. The data were analyzed descriptively qualitatively by giving categories of the level of religious attitudes of students ranging from very good, good, sufficient, and less. The ability of students in this activity can show an improvement after integrating water teaching materials with the verses of the Qur'an as well as distinguishing dirty water that has been filtered to produce clean water that can be used in everyday life.

RESULTS AND DISCUSSIONS

Researchers carried out this first product development step to analyze the needs of students for science learning. Analysis of student needs is carried out to determine the learning process that can develop STREAM-based water teaching materials using android so that students are more active and understand the required learning material. Needs analysis is based on developmental steps through observation when the science lesson is taking place and interviews with the teacher to obtain information about students' characteristics. The preliminary observations to find problems that exist during the science learning process have been described in the introduction. To strengthen this research, interviews with teachers were conducted due to observations to find out more about the problems that occur during science learning, problems regarding teacher understanding regarding the use of STREAM-based teaching materials using android as a learning media, especially interactive multimedia using PowerPoint.

The results of research through observations and interviews conducted with teachers can conclude that the use of STREAM-based teaching materials using android as a learning medium, especially interactive multimedia using PowerPoint, is very important and needs to be used for the science learning process. Water material is considered to have too much memorization, making students bored, difficult, and passive when learning so that the results cannot be adequately achieved. For this reason, students need pictures or video assistance in receiving learning materials so that students get audio-visual experience to understand the material presented, not just listening to explanations from the teacher.

The teachers have used PowerPoint learning media, but they only display pictures to convey learning material during the learning process. The use of multimedia learning can attract students' attention and make it more active in the learning process to be adequately achieved. The teacher has never used interactive multimedia using Android-based PowerPoint because of the limited ability and time to make it. Therefore, the teacher hopes that using interactive multimedia using Android-based PowerPoint developed by researchers can solve problems in the classroom because its use can make it easier for

students when learning to be more active and quickly understand the material presented.

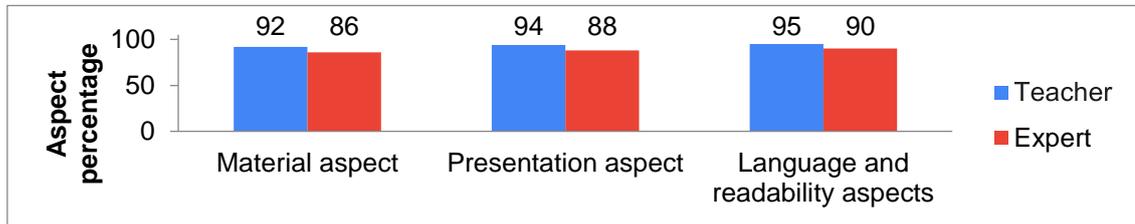Validation carried out by experts (lecturers) and teachers on Android-based teaching materials consists of 3 aspects: aspects of the material, presentation, and language and readability. The results can be seen in Diagram 1.

Diagram 1. Results of the Validation of Android-Based Teaching Materials by Experts and Teachers

Diagram 1 shows the validity of the teaching material by two experts (lecturers), reaching a score of 86% in the material aspect, 88% in presentation, and 90% in the language and readability aspects. Meanwhile, the validation carried out by five teachers showed maximum results on the material aspects of 92%, the presentation aspect of 94%, and the language and readability aspect of 95%.

The study results were in the form of data analysis. There was an increase in the pre-test to post-test values after students learning with the android application got a% N-Gain of 73%, with an average value increasing from 44.1 to 86 after learning using the android application. The results are shown in Table 3.

Table 3. The results of the pre-posttest analysis of problem-solving skills

Data of Android Implementation	*Pretest*	*Posttest*
Number of Students	50	50
Lowest Score	10	65
Highest Score	65	100
Average Value	44,1	86
% N-Gain	73 % (high)	

Based on research that has been conducted on 50 students on problem-solving skills, it was found that the posttest results showed an increase in the average value compared to the pretest results. It is in Diagram 2.
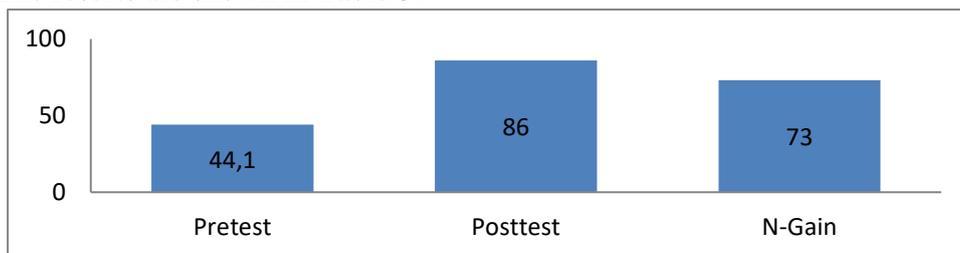

Diagram 2. Comparison of the average value of the pretest and posttest, N-Gain

The research results in data analysis on religious attitudes have increased after students learned with the Android application and integrated the science material about water in the al-Quran verse, then distinguishing and using holy water. One of the verses of the Qur'an which is integrated with the material of water, which can be used for worship (ablution) which is contained in the letter Al Maidah verse 6:

يَٰٓأَيُّهَا ٱلَّذِينَ ءَامَنُوٓاْ إِذَا قُمْتُمْ إِلَى ٱلصَّلَوٰةِ فَٱغْسِلُواْ

وُجُوهَكُمْ وَأَيْدِيَكُمْ إِلَى ٱلْمَرَافِقِ وَٱمْسَحُواْ بِرُءُوسِكُمْ وَأَرْجُلَكُمْ إِلَى ٱلْكَعْبَيْنِ وَإِن كُنتُمْ جُنُبًا فَٱطَّهَّرُواْ وَإِن كُنتُم مَّرْضَىٰٓ أَوْ عَلَىٰ سَفَرٍ أَوْ جَآءَ أَحَدٌ مِّنكُم مِّنَ ٱلْغَآئِطِ أَوْ لَٰمَسْتُمُ ٱلنِّسَآءَ فَلَمْ تَجِدُواْ مَآءً فَتَيَمَّمُواْ صَعِيدًا طَيِّبًا فَٱمْسَحُواْ بِوُجُوهِكُمْ وَأَيْدِيكُم مِّنْهُ مَا يُرِيدُ ٱللَّهُ لِيَجْعَلَ عَلَيْكُم مِّنْ حَرَجٍ وَلَٰكِن يُرِيدُ لِيُطَهِّرَكُمْ وَلِيُتِمَّ نِعْمَتَهُۥ عَلَيْكُمْ لَعَلَّكُمْ تَشْكُرُونَ

Meaning: "O you who have believed, when you rise to [perform] prayer, wash your faces and your forearms to the elbows and wipe over your heads and wash your feet to the ankles. And if you are in a state of *janabah*, then purify yourselves. But if you are ill or on a journey or one of you comes from the place of relieving himself or you have contacted women and do not find water, then seek clean earth and wipe over your faces and hands with it. Allah does not intend to make difficulty for you, but He intends to purify you and complete His favour upon you that you may be grateful." (QS. Al Maidah: 6)

In the above verse, Allah mentions the requirements and procedures for combining purification with air and purification with tayammum. Water is the main medium, although other objects can be used as a medium for purification, such as soil. The ground can remove heavy unclean like dog licking, but the main thing is still purified using water seven times. The earth is only one of them. The land can be used for cultivation, but while there is still water, the tayammum is still not being worked on.

Researchers took several steps to develop interactive multimedia products using Android-based PowerPoint, designed as attractive as possible based on interactive multimedia aspects for students. Product design development steps include: Products designed by researchers used software in Microsoft PowerPoint 2016 with several specifications for instructional media products. The first stage of interactive multimedia development using PowerPoint for science learning is designed for teachers and students. The second stage of interactive multimedia using PowerPoint, which is developed, contains several components, namely text, animation, images, and video.

The third stage. The menus displayed in interactive multimedia using PowerPoint include The opening slide, which contains the title of the theme, sub-themes, and lessons that will be delivered; Slide instructions for using buttons on interactive multimedia using PowerPoint; Learning Identity Slides: Core Competencies and Basic Competencies, Learning Competency Indicators, and Learning Objectives; Learning material slides: learning materials, pictures related to the material, videos related to the material, animations related to the material, group assignments that students must complete; Slides about learning evaluation questions; Reference slides used to develop interactive multimedia using Powerpoint. The fourth stage of interactive multimedia development using Powerpoint utilizes several features in Microsoft PowerPoint itself, namely the use of actions to create custom shows, run macros, and highlight clicks. The use of video is to display videos. The use of transitions is to replace the transitions of multiple slides. The use of animations is to create motion animations on several objects on a slide. The use of developers is to display answers and scores on evaluation questions.

The fifth stage of interactive multimedia using PowerPoint shows more pictures or animations related to the material and minimizes reading text. The sixth stage also includes several videos related to the material presented, such as the water purification process. The seventh stage of the language used in the reading text is also adjusted so that the use of language is more communicative and easily understood by students. The eighth stage of the evaluation questions is presented in interactive multimedia using multiple-choice PowerPoint based on learning indicators. Students will know the right or wrong answer chosen. Each multiple-choice answer will be given feedback so that students can find out the reason for the answer. Finally, students can find out the score obtained after working on the evaluation questions. The following is an example of a slide contained in Powerpoint interactive multimedia with the topic of Water Cycle.

Figure 1. STREAM-based Water Cycle

Figure 2. Water Cycle Animation

The material to be delivered must be based on basic competencies that have been adjusted to the 2013 Curriculum so that researchers develop indicators based on existing basic competencies. In the next step, the researcher began to compile learning activities. Students would find it easier to operate interactive multimedia using android and participate in learning activities well, so the researcher made instructions for using buttons that students could operate. In the next step, the researcher began to enter the learning material collected by adding pictures, videos, and animation to learn that was carried out to be more attractive, interactive, and easily understood by students based on learning indicators.

The initial stage of developing STREAM-based teaching materials using Android-based Powerpoints is to analyze students' needs through observation during the Water Science learning topic and interviews with teachers to obtain information about students' characteristics. MTs Al Ma'tuq Putri Sukabumi was used as a place of research by researchers. The material is considered difficult because of too much memorization, and so on. If the problem is not resolved, students have difficulty understanding the material so that the learning objectives are not achieved. The development of STREAM-based water teaching material products using interactive multimedia was chosen because it has several characteristics that are different from other learning media, for example combining elements of animated video, being interactive, meaning that it can accommodate user responses, and is independent, which
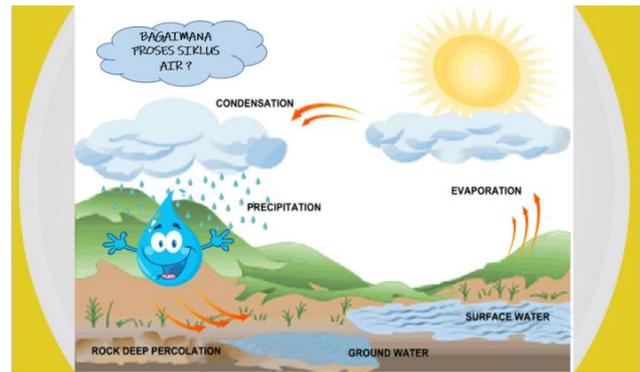
provides convenience and completeness of content in such a way so that users can use without the guidance of others.

With the research results on STREAM-based water material using android, students can improve skills in solving problems and religious attitudes. The integration of STREAM in water material covering the domains of Science, Technology, Religious, Engineering, Art, and Mathematics has provided new learning experiences. The STREAM learning model that is applied to students can affect their ability to solve a given problem. It can be seen from the difference in the pretest before being given learning activities with posttest after the learning process, which shows an increase in learning outcomes. Journal references that have been done by other researchers, namely traditional biotechnology content through STREAM-based learning strategies, can equip student creativity by Agustina et al. (2019), science and technology for a sustainable future in implementing STREAM education (Ithnina et al., 2013)

Students, when learning to use android with water teaching materials, can listen to water cycle videos so that the material can be easily understood. Images and also moving animations that the researchers deliberately present to attract the attention of students and also not get bored quickly in the learning process. Innovations in the development of interactive multimedia that can be used in android applications, from this study's results, are beneficial for students in learning during the current pandemic. Increased understanding

of students on learning material contained in the Android application affects learning outcomes. Some researchers who have carried out their research based on android include the system dynamics approach in gamification using android (Kotsopoulos et al., 2019). Designing a web-based smart tutoring system for learning android application development (Rekhawi et al., 2018)

Pretest and posttest questions are given to students for problem-solving in the form of a question "Why is the small amount of fresh water on earth compared to seawater not used up continuously by humans?" Before being given the teaching material, there were many answers from students, such as because of Allah's power, water is there to be used if the water runs out, we can die, and so on. After being given the teaching material, there was an increase in answering these questions, so that the value achieved increased from an average of 44.1 to 82 with an N-gain value of 65%. Many students answered because of the water cycle process. Thus, it can be seen that there is an increase in the learning process, which has an impact on the quality of higher learning outcomes. Research in improving problem-solving skills has also been carried out by several researchers, including fostering students' ability to solve context-based problems (Yu et al., 2014), evaluating conceptual learning and problem-solving achievement of students with peer instruction (Gok, T. 2015). Test the Problem Based Learning (PBL) learning model on critical thinking skills and student learning outcomes (Bashith & Amin, 2017).

Aspects of the religious attitudes of students are obtained by giving the task of integrating science on water material with the verses of the Qur'an. Then students can distinguish and also use holy water. Previously, students were reluctant because the reasons related to the verse of the Qur'an were only religious lessons such as hadith, fiqh, and other religious lessons. However, after being given STREAM-based water material and students were required to bring the Qur'an when they returned to the same task, they were very enthusiastic in looking for answers in the Al Qur'an. Some were chanting the verses of

the Quran in search of the jawan, and some were reading the meaning of the verses of the Qur'an in a poetic tone. Some even looked for the answers by continuing each verse they had memorized. There is an increase even the results are very high, which initially the average number is 46 to 86. This shows a very significant increase in students with STREAM-based water material using android. There have been many researchers in conducting their research based on religious attitudes, as was done by Ok (2016) comparing the content and psychometric properties of ok religious attitude scales in the Islamic tradition. It was assessing the dynamics between Muslims of different groups (Bergen et al., 2015). Application of the Problem Based Learning (PBL) model, which integrates Islamic values based on information and communication technology to higher-order thinking skills and strengthening students' character (Anwar, 2017).

CONCLUSION AND RECOMMENDATION

Learning using STREAM-based teaching materials using android is proven to be effective because it has improved students' problem-solving skills and religious attitudes in learning with water material. Using android in the science learning process during the current pandemic makes it easier for students to follow teaching and learning activities wherever they are. The provision of interesting content on the Android application can streamline learning activities so that students are not bored with the presentation of the material being taught. Increased problem-solving skills of students can be seen based on understanding after STREAM-based learning activities using android by providing pretest and posttest test questions. Religious attitudes in the good category can be seen from the ability of students to integrate water teaching materials with the Qur'anic verses and can distinguish dirty water from clean water after filtration.

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