



## Smart Apps Creator 3 Interactive Multimedia Based on Stream to Improve Students' Scientific Literacy During the Covid-19 Pandemic

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**Abstract:** By applying a learning-based approach model Science, Technology, Religion, Engineering, Arts, Mathematics in online learning, this study intends to investigate Smart Apps Creator, an interactive multimedia application to promote students' scientific literacy. SAC interactive multimedia is used to learn the media and comprehend scientific concepts. Explaining problems, designing research, carrying them out, analyzing data, evaluating findings, and sharing knowledge are all aspects of scientific literacy. Through the use of this program, STREAM-based learning is being used to improve students' scientific literacy. The results of the students' pretest and posttest were used to collect and analyze the study data in the form of quantitative descriptive analysis. With 80 responses among the students who participated in the survey and five science teachers who had used STREAM-based interactive multimedia, the study tool was delivered to the target population via a WhatsApp group. The findings indicated that the average percentage of scientific literacy with N-Gain in the medium category was 68%, indicating an improvement in student learning as a result of the use of SAC interactive multimedia learning. The study's findings demonstrate that SAC-based STREAM interactive multimedia learning is statistically highly significant and has been demonstrated to be successful in raising students' levels of scientific literacy in online learning during the present epidemic.

**Keywords:** sac interactive multimedia, stream, scientific literacy

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### INTRODUCTION

Curriculum development is very important related to its implementation in the field. Guidelines for Curriculum Development for junior high school level in science education stated that learning at the junior high school level is integrated. Aspects of science learning are based on the attainment of knowledge, attitudes, and skills. The aspects have an essential role in developing all aspects of the students' skills in the learning process. The events in science learning are closely related to everyday life. The success of the curriculum in Indonesia is an educational goal that can produce students in creating productive, creative, innovative, and characteristic human resources as the nation's next-generation (El Islami et al., 2016; Al Faris, 2016; Sultoni, 2016; Safitri et al., 2018; Bahri, 2018)

The World Economic Forum develops 21st-century education, which consists of 16 skills that students must have to survive and succeed both now and in the future (Wefusa, 2015; Rokhmah et al., 2017; Simamora et al., 2020). Skills consisting of 16 points are divided into three major groups, namely Basic Literacy, which is the ability of children to apply core skills in daily tasks. Skills related to basic literacy consist of numeracy, science, and information technology. Both competencies are the ability of children to face and handle the complex challenges they face. Critical thinking and problem solving, creativity, communication, and cooperation are competency-related skills. Finally, the three characteristic qualities are skills related to self, including Curiosity, Initiative, Persistence/Fortitude, Adaptability, Leadership, Social and Cultural Awareness.

Literacy is the basis of a student's ability to understand and use knowledge for their requirements in addressing challenges and their ability to apply key abilities in daily chores. People with knowledge of science and technology are those who can apply their understanding of the interrelationships between science, technology, and society to solve problems in the real world (Odegaard et al., 2015; Wang & Zhao, 2016; Rokhmah et al., 2017; Suratno et al., 2020; Aninda et al., 2020). At a time when the 21st century skills learning began to develop (Trilling & Fadel, 2010), to prepare the current generation of individuals living in the 21st century for a time when the major goal of science education was decided to be scientific literacy (Odegaard et al., 2015; Wang & Zhao, 2016; Kartika et al., 2019; Simamora et al., 2020; Yuningsih et al., 2022). To thrive in his life and work in the future, he will therefore need to be capable of scientific literacy and to have a positive attitude toward science.

One of the concerns that needs to be taken into account is the significance of scientific literacy in Indonesia. Indonesian students' scientific literacy levels are often in the lowest measurement stage according to the PISA (Program for International Students Assessment), which is still below the average when compared to the average international score. Numerous research conducted between 2000 and 2019 found that Indonesian education generally falls short of guiding pupils toward scientific literacy. According to the Organization for Economic Cooperation and Development (OECD), Indonesia received a PISA score of 393 in 2000, placing it 38th out of 41 nations. It was ranked number 38 out of 40 nations in 2003 with 395, number 50 out of 57 nations in 2006, and number 60 out of 65 nations in 2009 with 383 respectively. The worst year was 2012, when it had a ranking of 383 and was ranked 64th out of 65 nations. 2015 received a score of 403, placing it at position 64 out of the participating 72 nations. Additionally, with 382 points, it was rated 71st out of 78 countries in 2018 (OECD, 2003; OECD, 2013; OECD & ADB, 2015; OECD, 2016; OECD, 2017; OECD, 2019). According to the study results, Indonesian students' levels of scientific literacy are still much below those set by international standards.

The interaction between teachers and students is the main goal in an educational environment (Rosyad et al., 2013; Inah, 2015; Pane & Dasopang, 2017). The teacher holds a prominent role in achieving the overall process in education based on reciprocal relationships (Inah, 2015; Meilan et al., 2017; Pane & Dasopang, 2017). At first, the teacher was the primary source of learning in education, but over time, in teaching and learning activities, books were beneficial for teachers who were used as a second source of learning. Learning media that are used as teaching aids for teachers should be used as learning resources. The lack of effectiveness in delivering material causes students to tend to be passive, resulting in boredom with the given subjects. The result is not given the strengthening of understanding of memory, critical discovery of ideas and only making notes in a monotonous form (Inah, 2015; Pane & Dasopang, 2017; Afifah, 2018).

The faster the development of Information and Communication Technology nowadays, the world of education must follow it. As the learning method in the current era of globalization, ICT is an essential tool for developing learning media and multimedia. This can support the development of interactive media that influences all activities, including education to manufacture teaching materials (Aziz Hussin, 2018; Gamar et al., 2018; Orgaz et al., 2018; Traxler, 2018; Shatri, 2020). In the past, the teacher conveyed and transferred his knowledge by explaining using chalk, then changed to using markers, and now in the digital era, it is demanded to follow the development of all digital times. Therefore, learning activities are increasingly sophisticated by using interactive multimedia, both laptops and Android phones.

The current COVID-19 pandemic is an infectious disease in almost all countries in the world. This led to the first global health crisis in the millennium, including in Indonesia. The impact is very influential for all groups, including the education sector (Ayuni et al., 2020; Bao, 2020; Dewi, 2020; Dhawan, 2020; Fitriyani et al., 2020; Hodges et al., 2020; Mahase, 2020; Sadikin & Hamidah, 2020; World Health Organization, 2020). All schools and colleges in almost all countries enforce a Distance Learning policy online (Sintema, 2020). Of course, this has become a phenomenon that then drastically changes the process and procedures of teaching methods for teachers directly through digital remote tools (United Nations, 2020). Thus, teachers are increasingly thinking critically to meet the intake of knowledge to students. Strategies and methods become materials for innovation so that the learning process in class is fun. So in its implementation, effective multimedia development learning is a challenge that the teacher must prepare.

Teachers can develop multimedia using the Smart Apps Creator (SAC) software, a mobile, desktop, and web-based multimedia application that can be accessed via a browser (Kusumaningsih et al., 2019; Khasanah et al., 2020). The Smart Apps Creator (SAC) interactive multimedia mobile apps application can be used for educational, training, and learning activities or content. For example, the teacher can arrange the material to be taught in various media into a multimedia learning device. To realize 21st-century learning also requires learning model innovations in approaches, methods, strategies, and techniques.

One of the instructional strategies to improve students' scientific literacy is the STREAM (Science, Technology, Religion, Engineering, Arts, Mathematics) approach. STREAM is a development of the STEM approach that adds elements of religion and the arts in addition to the main parts of science that might be related to one another (Agustina et al., 2018; Hardjo et al., 2019; Azizah et al., 2020; Mubarak et al., 2020). The art aspect is related to the creative aspects of students, the ability to imagine, innovate in using technology, produce products, and have a sense of art in understanding science (Agustina et al., 2019; Wan et al., 2020). The religion aspect is a belief in carrying out the religious teachings that he believes in. The Islamic religion used in this study adapts to the 2013 curriculum (Agustina et al., 2018; Nasir et al., 2020). The implementation of STEM education can be contained in conventional subjects such as science and mathematics, which are then integrated into engineering and technology learning (English & King, 2015; Rusyanti et al., 2019; Ülger & Çepni, 2020). The ability to apply academic information in the real world is a must for students. In-class STEM-based science instruction is intended to present opportunities.

Based on the results of a preliminary study with 34 Madrasah Tsanawiyah teachers in Sukabumi, it was found that the teacher had never used the STREAM-integrated interactive in both offline and online science learning multimedia learning resource which contained religious-based material. In addition, 73.5% of teachers have not trained students in problem-solving skills. The need for solutions to solve existing problems is because this impacts the quality of attitudes and graduates of Madrasah Tsanawiyah students. Teachers who have integrated science learning with religious aspects are only 41.2%. This is because it tends to follow the material in the textbooks used by students in modern science. Their discoveries show how western scientists work for science. Without mentioning that Islamic scientists have contributed significantly to the advancement of science, it is as if science is a product of the creativity and intelligence of western culture. While the preliminary study results of 80 students, there are weaknesses that they have related to scientific literacy. To overcome this problem to increase scientific literacy towards students, it applies the STREAM approach.

## METHODS

This research used quantitative research and experimental methods that refer to (Sumantri & Permana, 1999). The design used is the one-group pretest-posttest. Students were given a test (pretest) to determine their initial skills in scientific literacy at the beginning of learning activities. Then they were given treatment in the form of learning using STREAM-based SAC interactive multimedia. After being given treatment, at the end of the lesson, a test (posttest) was given to determine the students' final skills towards scientific literacy. In this case, the use of STREAM-based SAC interactive multimedia in online learning for students significantly improves scientific literacy.

A population is a group that is used as the object of research to conclude the research results (Winarni, 2011). The population in this study was 244 students of class VII of Madrasah Tsanawiyah. The sample is part of a population that can be interpreted as any set (Winarni, 2011). The sampling technique was random cluster sampling. Students were randomized until a sample of 80 people was obtained who were used as an experimental class. Based on a literature review, the potential and problems of this study were the low scientific literacy of students at the international level and the lack of science learning media developed based on aspects of scientific literacy in schools.

In this research, the instrument used for data collection was an online test given to students through the WhatsApp group distributed in a Google Form. Sugiyono (2016), in principle, research is to measure, so in conducting research, there must be an excellent measuring instrument, so the research instrument is a tool used to measure observed natural and social phenomena. Observation, evaluation, interviews, questionnaires, and tests are some of the tools used in research so that it can be obtained that it is easy to collect data as expected. Winarni (2011) uses several types of tests in educational assessments, namely personality, talent, intelligence, interests, achievement, and attitudes. In this study, the tool used is a type of test, namely a multiple-choice intelligence test of knowledge with four alternative answers because it is used to measure student learning outcomes.

The data collection technique used in this research was descriptive and quantitative, from giving tests in pretest and posttest to students. This research was conducted through the WhatsApp group distributed via Google Form by distributing a questionnaire in the same objective questions. In addition, the effectiveness of interactive multimedia was measured using a one-group pretest-posttest design study which refers to Fraenkel et al. (2012). The schematic is shown in Table 1.

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

Pretest	Treatment	Posttest
T <sub>1</sub>	X	T <sub>2</sub>

The assessment of students' scientific literacy in problem-solving is done through this pretest-posttest process. Before students get treatment, T1 serves as a pretest; X serves as a treatment delivered via interactive multimedia based on STREAM using SAC; and T2 serves as a posttest administered following treatment. When the residual value is normally distributed, the normality test is not performed to determine the significant value in the Asymp column. If the residual value is normally distributed, the paired sample t-test is used; however, if it is not normally distributed, the mean significant difference test can be performed using a non-parametric statistical test (Wilcoxon test) (George & Mallery, 2018). To establish if there is a significant difference between the pretest and posttest data on the significance of problem-solving skills, the value of Sig p0.05 is employed. However, if the value is Sig p>0.05, the values of the pretest and posttest data do not significantly differ. Once it was shown that the data had a normally distributed distribution, an N-Gain test was performed by dividing the discrepancy between the posttest and pretest scores by the maximum score minus the pretest scores.

Based on student input, the success of the interactive multimedia STREAM-based SAC is determined. Quantitative data from learning daily test outcomes is used to compile information on scientific literacy abilities. The values of the data were then evaluated by calculating N-Gain based on the category proposed by Hake (1999), as shown in Table 2.

**Table 2.** Interpretation of N-Gain

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

## RESULT AND DISCUSSION

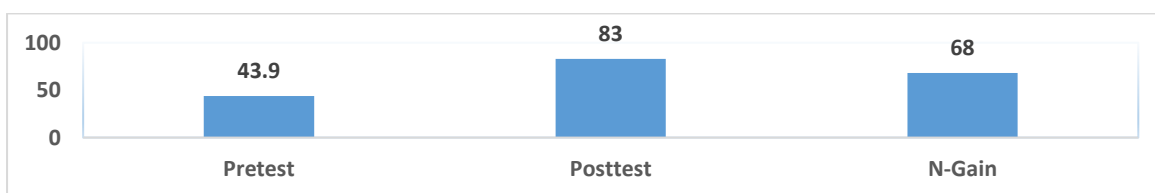
The findings are the expected results of this study. Everything is presented through tables and diagrams from the students' pretest and posttest results to find a correlation between the effects of using STREAM-based SAC interactive multimedia with increased scientific literacy. The use of STREAM-based SAC interactive multimedia becomes an attractive and interactive learning medium during the learning process. The material in science learning, which was initially considered much memorization after using interactive media, turned into interesting learning. Students need a picture or video support for receiving educational materials so that students get an audiovisual experiencing, not just hearing the teacher explain things, is necessary to comprehend the information offered. In order to teach science, teachers have never used interactive multimedia that is STREAM-based SAC.

Due to the limited time and resources available, the teacher only utilizes PowerPoint, which displays an image, to present information in class during the learning process. SAC interactive multimedia can draw students' attention and encourage participation so that learning objectives are successfully met. The teacher therefore believes that the adoption of STREAM-based SAC interactive multimedia created by researchers can solve issues in the classroom because it can help pupils learn more actively and comprehend the information offered more rapidly. After instruction using STREAM-based SAC interactive multimedia, students' pretest to posttest scores improved with an N-Gain of 68%, with the average score rising from 43.9 to 83. This data is given in Table 3.

**Table 3.** The results of the pretest and posttest on scientific literacy

Data	Pretest	Posttest
Number of students	80	80
Minimum score	10	60
Maximum score	65	100
Average score (mean)	43,9	83
% N-Gain	68 % (medium)	

Based on the study that was conducted with 80 students as participants to develop scientific literacy, it was discovered that the average score increased between the pretest and posttest results, as shown in Figure 1.



**Figure 1.** Comparison of the mean score of the pretest and posttest, N-Gain

The interactive multimedia specification used in this study was Smart Apps Creator (SAC) 3 for science learning at Class VII of Madrasah Tsanawiyah. Interactive multimedia is a mobile, desktop, and web-based multimedia application that can be accessed via a browser (Kusumaningsih et al., 2019; Khasanah et al., 2020). SAC is designed with an interactive multimedia form that users can use easily anywhere and anytime, especially now in the conditions of the COVID-19 pandemic. The delivery of material on SAC interactive multimedia uses images and videos. Parts of interactive multimedia products include application loading and cover pages, start menu, introduction, materials, educational games, question practice pages, creator or developer pages, reference pages. The material (content), language and imagery, and presentation are all factors that impact quality. Interactive multimedia has different sizes as needed (can be changed).

SAC 3 interactive multimedia for science learning at class VII Madrasah Tsanawiyah is integrated with

the STREAM approach learning model (Agustina et al., 2018; Azizah et al., 2020; Mubarok et al., 2020). The material used in this science learning is water. The concept of water studied includes all the components of Science, Technology, Religious, Engineering, Art, and Mathematics incorporated in STREAM. Science is the mastery of the concept of water in life. The technology in this context is a product of filtration technology to produce clean water and a waterwheel that can be used as an energy source. Religion can be seen in the concept of water contained in the Qur'an, which is used for ablution Engineering is created with an action plan to address filthy water that can design a filter system to produce clean water. Plants (flowers) preserved in water that has been colored red, yellow, and blue at each site exhibit domain art. Calculating the discharge of clean water made during the filtration process is mathematics in this context.

SAC interactive multimedia is dominant in increasing scientific literacy by applying the STREAM learning model, namely the Science concept. Students can understand the material through the aid of visualizing animated images and videos. Problem-solving in practice questions that students must solve can be solved with excellent results. Problem-solving can be done through a combination of technology and engineering elements during practice to produce clean water. The concept of art appears in the filtered water that has been given red, yellow, and blue colors in each place, and then a flower is placed in each place. Religious elements in science material, initially students feel displeased. But after learning the STREAM-integrated content, students were eager to be assigned the assignment of fusing science with water-related material found in Qur'an. Students do mathematical operations to determine the water discharge present in the tube or container.

According to the report's results, multimedia makes it simpler for students and teachers to learn even though they are located in separate regions. The application is in the interaction learning process, which is available anytime and everywhere. This is really helpful, especially with the current COVID-19 outbreak's requirement for online education. The nation's future leaders will benefit from interactive multimedia produced by Smart Apps Creator (SAC) in the current technological age. The learning process in the twenty-first century requires improvements in learning models.

## CONCLUSION

The Smart Apps Creator (SAC) interactive multimedia developed by integrating the STREAM learning model can improve the scientific literacy skills of Madrasah Tsanawiyah students. Students can more easily follow teaching and learning activities wherever they are while using interactive multimedia in the science learning process during the present pandemic. In order to prevent students from becoming disinterested in the way that the material is presented in class, SAC might streamline learning processes. When interactive multimedia is used in STREAM-based learning activities and pretest and posttest questions are given, the improvement in students' scientific literacy can be seen based on their knowledge. It is now simpler for students and teachers to study in the digital age even though they are in various locations but can still communicate with one another. SAC interactive multimedia is one approach of addressing current or upcoming learning issues.

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