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Analysis of students' science process skills by developing a Science Technology Society (STS) model that integrated religious values at Al-hasan Senior High School Jember

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***Abstract*—** *This study aimed to obtain information needs (need assessment). The implementation of this study used the descriptive and experimental study to develop a learning model of Science Technology Society (STS) integrated with religious values that effective, practical, and valid to improve students' science process skill. The current research used the 4D Thiagarajan model. This study used a validation sheet instrument of learning models and teaching materials which included teacher and student questionnaire sheets, and science process skill sheets. Data collection used quasi-experimental by giving students' pretest and posttest questions of science process skills covering 5 domains comprise the concept domain, process domain, application domain, creativity domain, and attitude domain to students at AL Hasan High School, Panti District, Jember Regency, 2020/2021 academic year. The data were collected from 35 students of the experimental class and 35 students of the control class. The experimental class was given learning treatment-oriented science discovery technology integrated community religious values, while the control class used conventional learning. Science process skills data were obtained based on observations. The results of the value of science process skills obtained an average increase in pretest and posttest experimental class by 33 points and an average increase in pretest and posttest control class by 14 points. The results of the science process skills hypothesis test of students in the experimental class and the control class had a significance value of less than 0.05, so it can be concluded that the learning model based on science discovery technology that integrated religious values had a significant effect on students' science process skills.*

I. INTRODUCTION

Education is a lifelong process that starts from home and continues as formal and informal exercises [3]. How a human learned about life and the success in learning life lessons depends on what he has previously learned. Attitudes influence perception and development through the learning process and are ultimately manifested in behaviour. Physics is a science learning requires the right approach by the characteristics of science. In fact, in reality, the teacher prioritizes the results rather than the process of students acquiring knowledge. Teachers rarely provide direct experience to students in carrying out scientific activities to reinforce previously accepted theories. Due to the lack of interest of students in studying physics, it causes the learning process to be not optimal so that it affects students' cognitive outcomes [1]. The learning process based on the results of observations in

physics learning found that the teacher prioritizes the product aspect rather than the process aspect so that the involvement of students in the learning process is still lacking. Teachers rarely provide experience to students in carrying out scientific activities, such as loading problem formulations, making hypotheses, testing hypotheses, processing data, and communicating them in front of the class to strengthen the concepts that have been learned, so that it has an impact on students' scientific thinking skills. PISA 2012 revealed that Indonesian students are in position 64 out of 65 countries. So it is necessary to change the mindset of students that are formed when the learning process is carried out. Education is a lifelong process that starts from home and continues as formal and informal exercises [3]. How a human learned about life and the success in learning life lessons depends on what he has previously learned. Attitudes influence perception and development through the learning process and are ultimately manifested in behaviour. Physics is a science learning requires the right approach by the characteristics of science. In fact, in the field, the teacher prioritizes the results rather than the process of students acquiring knowledge. Teachers rarely provide direct experience to students in carrying out scientific activities to reinforce previously accepted theories. Due to the lack of interest of students in studying physics, it causes the learning process to be not optimal so that it affects students' cognitive outcomes [9]

Based on the purpose of science education, teachers must be able to develop students to make them interested in scientific problems, so that they can obtain and apply them properly for personal, social, and community interests. Physics learning must be able to provide understanding and meaning of science to students properly, which aims to make students able to relate physics concepts in real life so that students can construct their understanding from the material that they learned and apply it in everyday life because in the learning process students are allowed to share knowledge, find out for themselves science in everyday life [6]. Developing a scientific attitude is expected to be able to develop and discover the attitudes and values of students in carrying out the learning process. One of the expected scientific attitudes is science process skills. Science process skills are skills that include cognitive, manual, and social skills. Science process skills can be an alternative to improve the thinking skills of students in finding concepts as well as developing students' critical attitudes. Science process skills are the basis for students to develop scientific attitudes and problem-solving skills so that they are expected to be able to build creative, innovative, critical, open-minded and competitive students in facing global competition in society [4].

Results of interviews conducted with Physics teachers at AL Hasan High School, Panti District, Jember Regency showed that most students considered physics a difficult subject because there were many formulas and scientific languages without a good learning process causing students to have difficulty understanding and being bored. This causes the majority of students' scores less than Minimum Criteria of Mastery Learning (KKM) so that teachers often make remedial. Learning Physics should provide meaning and a good understanding of science for students so that students can connect concepts in physics with real-life and apply them so that students can construct their process of obtaining knowledge from the material obtained. Students' understanding will be better with active involvement than just seeing the content of the material concept [3]. The learning process with scientific activities had a positive impact on students in forming complex knowledge. Results of other studies indicate that the alignment of the cognitive and psychomotor aspects of students will be able to influence students' cognitive outcomes. Based on these problems, a learning model is needed that can accommodate the purpose and competencies that students must master, to be able to increase the value of science for the better. One of the models is science technology society learning (STS) [7]

The science technology society increases student knowledge by connecting science learning and technological developments in the community that exists in the student environment. So that in the learning process, students are trained to link the world of Science with human-made technology as well as the social experiences that students get in the environment of society that can improve students' abilities in the environment. Learning Physics that is integrated with the STS approach can evoke an attitude of science and technology, that science is not a science that only relies on memory to memorize, but is also related to the students' environment which can be applied in everyday life to facilitate human life [11]. Revealed that the integration of religion in learning is very important to achieve the students' purpose of being knowledgeable and believing which is the best human being (Insanul Kamil). The integration of the Holy Qur'an can stimulate students 'critical thinking skills and scientific attitudes as a benefit to study or study scientifically so that they can change students' paradigms towards religions that are different from science. Religion and science do not contradict each other either in concrete evidence through scientific studies in answering questions about the existence of the truth of revelation. On the material of physical quantities related to the Holy Qur'an, "We created everything in due measure and proportion "(Al Qamar: 49) [11].

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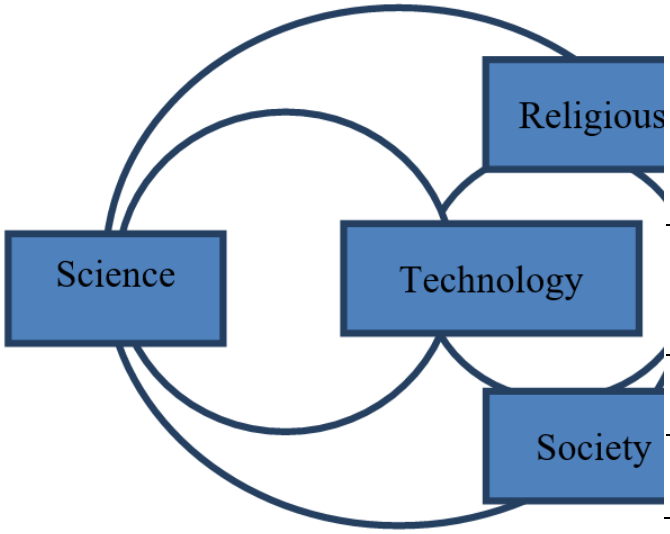

Fig.1. The correlation between science, technology, society, and religious values.

II. METHOD

The research aims to obtain information about teachers and students need, as well as a preliminary test of the STSintegrated with religious values development model before conducting a large-scale test. This study aims to obtain information about assessment need. Meanwhile, the development activities aim to produce a valid and effective STS integrated with religious values learning model. This determination design uses the 4D development method from Thiagarajan which includes define, design, develop and disseminate [7]. The subject of this research is the Science, technology, society, and religious development model in physics learning for high school students. While the research respondents were students and physics teachers at AL-Hasan High SchoolPantiJember. The data collection from respondent included learning observation sheet instruments, teacher and student response questionnaires, lesson validation models, and student science skills tests. The data were analyzed based on their type of qualitatively and quantitatively. Learning guide models, lesson plans, student questionnaires, and production tables through validation tests were analyzed descriptively and compared with criteria for practicality, effectiveness, learning material instruments, student work reports and lesson plans. Meanwhile, qualitative analysis includes the implementation of the learning model in the classroom. Revisions were based on the results of measurements and opinions by experts and physics teachers [3].The effectiveness data of the model was obtained by giving pretest to the experimental class STS integrated with religious values and the control class (conventional) before being given treatment. Moreover, post-test for the experimental and control classes after the learning process was carried out to determine the difference average in students' science process skills scores.

Table 1. Data collection on the results of students' science process skills in the experimental class STSintegrated with religious values and the control class (conventional)

No	Class	Average score of students' science process skills				
		1	2	3	4	5
1	Eksperimental					
2	Control					

Mean Score of Science Process Skills (KPS)

$$KPS = \frac{\text{Total Students' Score}}{Total\ \text{Score} x 100}$$

Information:

1: Mastery of concepts

2: Processing ability

3: Applicability

4: Creativity ability

5: Attitude[3]

Furthermore, statistical tests were carried out to determine the level of significance between the experimental class with the science technology society approach and religious values with the control class using conventional learning. Conducting a hypothesis test first carried out by the prerequisite test which includes the normality test, homogeneity, and one way ANOVA using the SPSS application. The total respondent in 10b class was 35 students as the experimental class and in 10c was 35 students class as the control class at Al Hasan High School, Panti District, Jember Regency on 11-12 September 2020.

III. RESULT

3.1Need Assessment

Some information about teacher skills in the teaching process by distributing questionnaires to 100 teachers in various schools in Situbondo and Jember.

Table 2. Results of distributing need assessment questionnaires to.

No	Activity of Learning	Teacher Respond
1.	Society has known the Science technology model.	30%
2.	Implementing of religious values in learning.	15%
3.	Implementing Science Technology Society.	60%
4.	Knowing the domain of students' science process skills	40%
5.	Applying all domains in measuring students' science process skills	30%
6.	Involving students in the learning process	60%

3.2 Learning model

Results of the survey and analysis of students' science process skills used a physics learning model based on STS integrated with religious values. The validation of the learning model which includes lesson plans, worksheets, and assessment of students' science skills can be seen in the following table.

Table 3. Validation of Learning Models and Teaching Materials.

Validation Aspect	Expert Teacher	Expert validator	Average	Category
The practicality of the model	85	75	80	Valid
Model guide	81.2	79.2	80.2	Valid
Material validation	72	76	74	Valid
Syllabus Validation	87	81,2	84.1	Valid
Lesson plan validation	82	78	80	Valid
Assesment	76	79	78	Valid

3.3 Practicality of the model

Learning model research aimed to obtain data on the practicality of the model and learning materials. The STS integrated with religious values research was conducted in 4 meetings involving students as research objects and physics teachers at AL Hasan High Schoolas observers. The teacher was observing and ensuring the course of the learning process. The practicality assessment data model

was obtained by filling out the practicality sheet by the teacher as an observer and the student as the object of research. The results of the validation of the learning model instrument are as follows.

Table 4. Validation of learning instruments.

Validation Aspect	Average	Category
The practicality of the model	81.60	Practical
Learning materials	79,25	Practical
Student involvement	86.25	Very Practical
Worksheet	78.25	Practical
Average	**81.37**	**Practical**

3.4 Effectiveness of Model

This study aimed to determine the differences in students' science process skills on the topic of physics quantities using the STS integrated with religious values approach with conventional learning. The data were collected and analyzed using the one way ANOVA test. However, before the one way ANOVA test was carried out, there are statistical prerequisites that must be fixed. Analysis of normality using the Kolmogorov-Smirnov test and homogeneity was a prerequisite that must be met before carrying out the one way ANOVA test. The data normally distributed if the significance value is p> 0.05, and the data variance was homogeneous if the significance probability value is p> 0.05.

Tabel 5. Normality test of data distribution.

Data Test	Experiment Class		Control Class	
	Sig	Result	Sig	Result
Data Normalitas Pre Test	0.010	Normal	0.011	Normal
Data Normalitas Post Test	0.200	Normal	0.022	Normal

Based on the normality test in the table above, the significance results of the pretest data for the experimental and control classes as well as the posttest data for the experimental and control classes were more than the significance value of 0.05. So it can be concluded that the data were obtained from a normally distributed population.

Table 6. Homogenity test of data distribution

Data Test		Levene S.	df2 df1	df2	Sig.
Data Homogenity	Based on Mean	1,133	3	136	,338
	Based on Median	1,082	3	136	,359
	Vased on Median and with adjusted df	1,082	3	125,670	,359
	Based on Trim mean	1,170	3	136	,323

As for the homogeneity test, it can be seen that the data tested has a significance value greater than 0.05, so it can be concluded that the data is homogeneous. This means that the data can be carried out further tests, namely the one way ANOVA analysis test to determine the effectiveness of the model in improving students' science process skills.

Table 7. One way anova test.

Class	Sig.	Result
Experimen and Control	0.000	Different

Based on the one way ANOVA test, the significance value is less than 0.05. It means that there can be differences in the types of student skill outcomes between the experimental class and the control class. Furthermore, the descriptive analysis is carried out to describe the results of students' science process skills.

Table 8. Descriptive data.

	Pre Test of Experimental Class	Pre Test of Control Class	Post Test ofExperimental Class	Post Test of Control Class
Mean	45.11	44.49	78.80	58.89
Lower Bound	41.50	41.03	75.50	56.35
Upper Bound	48.73	47.94	82.10	61.42
Minimum	23	28	60	45
Maximum	65	60	98	70

Descriptive analysis showed that average of the pre-test of the experimental class was 45.11, while the control class was 44.49, which means that the average value of the pres test before being treated with the integrated STS integrated with religious values are almost the same so that the two classes are eligible to be research objects. Whereas the average of the post-test based on the descriptive analysis in the experimental class was 78.80 which was significantly higher than the average of the control class (58.89) as in the following graph.

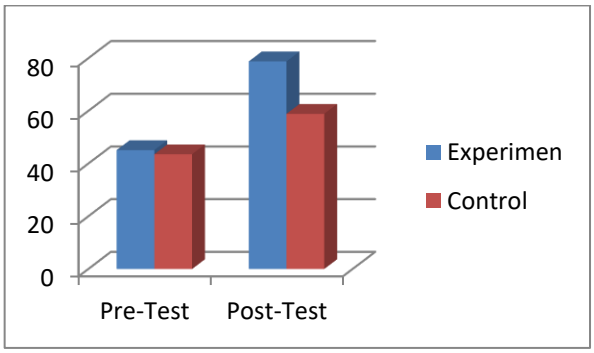

Fig.2. Graph of students' science process skills improvement.

IV. DISCUSSION

4.1 Need Assesment

The results of the questionnaire given to 100 teachers can be seen in table 2. The results showed that 70% of the teachers knew the approach of technology science society model, while 30% did not know it, meanwhile, in implementing the STS approach model in the learning process 60% of the teachers implemented it, 10% did not implement it, and 30% sometimes implement it. The implementation of religious values in learning showed that only 15% of teachers say yes, 60% did not implement it, and 35% sometimes implement it. Meanwhile, for the teachers' knowledge about the science process skills for students was 40% of the respondents said they knew, and 60% said they did not know. The implementation of deep science process skills was 60% of respondents said yes, 30% sometimes, and 10% never. While the teachers' knowledge of science skills in students was 40% of respondents and 60% of respondents did not notice. The implementation of the domain concept, process domain, domain application, creativity domain, and domain attitude as references in the assessment were 30% of respondents said Yes to apply, 40% of respondents only applied a few, and 45% of respondents did not apply it at all. And student involvement in the learning process was 60% of respondents involved students actively, 15% sometimes, and 30% Not at all, it means that the teacher took all the time theory only without connecting to real life.

4.2 Learning Model Validity

The validation of the development of a physics learning model based on science, technology, and society integrated of religious values was carried out by 2 experts covering aspects of construction, content, and language accuracy. The lesson plan validation data, student worksheets, and assessments can be seen in table 3. The results of the validation of the STS learning model development

instrument was valid and fix category to be applied in the physics learning process following the chapter on physics quantities [2].

4.3 Practicality of The Learning Model

Results of learning observations showed that the learning model in a practical category and suitable for the teacher to apply in the physics learning process in the physics chapter. The assessment of teachers and expert validators on the lesson plans, worksheets and STS integrated with religious values models in the practical and fix category can be seen in table 2. Average of the results of the validation of the practicality model by students obtained was 81.37. It indicated that the indication of physics learning with the STSR model in the practical category and fix as improvement students' science process skills .

4.4 Effectiveness of the Learning Model

The effectiveness of the development model of science, technology, society, and religion to improve the process of student skills in terms of student competence in aspects of the 5 domains, comprise domains concept, domains process, domains application, domain creativity, and attitudes. Data obtained from the results of the pretest and posttest before learning and after learning began from the experimental class and control class to know the level of effectiveness. Average of science process skills of the experimental class students STSintegrated with religious values were higher than the control class (conventional) which can be seen in Figure 2. Average pretest and posttest scores of the experimental class showed that there was a significant increase compared to the control class. The average score of pretest in the experimental class was 45.11 (not good) and the posttest score was 78.80 (very good) the proportion of completeness of science skills on the determined score was 72% of all students. Whereas in the control class, the average score of the pretest was 44.49 (not good) and posttest was 58.89 (not good) and the proportion of completeness of science process skills was 20% of all students. Furthermore, it can be concluded that the development of learning models for science, technology, society, and religious efficiency in improving students' science process skills.

The STS approach was chosen with the consideration of developing students' science skills because of the interaction of cognitive, psychomotor, and affective aspects were formed when students constructed the process of obtaining knowledge by themselves [5]. The integration of religion in the STS approach was also able to stimulate the ability to think critically and scientifically at students' attitudes as a benefit to study or study scientifically. Moreover, it can change students' paradigms towards religion that is different from science. Religion and science do not contradict each other either in concrete evidence through scientific studies in answering questions about the existence of the truth of revelation [12]. In the experimental class, learning about the chapter on physics quantities was given an apperception in the form of social problems related to physics and connected to the verse from the Holy Qur'an, "We created everything in due measure and proportion ". (Al Qamar: 49). Students were formed in groups and worked together in providing the phenomena of daily life and the verses of Holy Qur'an that relevant to physics on the worksheets.The group was formed of 5 students. Learning with groups was based on that learning with friends increased collaboration, the communication needed by students in their community which consists of communication, discussion, exchange opinions, and collaboration that was able to build new understandings about phenomena in the community. Every student had the same opportunity to argue, listen, and collaborate to achieve the purpose together. The STS model integrated with religious values approach model includes 4 phases.

a. Stimulating students to formulate problems by observing phenomena/problems in the society environment and engaging students to understand the basic concepts of physical quantities, history, and objectives and their various quantities [1], and their relevance to the verse of Holy Qur'an, "We created everything in due measure and proportion". (Al Qamar: 49).
b. Guiding students to find and construct their process of gaining knowledge and understanding by exploring based on society environment phenomena, comprise the use of physics to help humans in everyday life [8].
c. Applying the concepts studied and the benefit in society environment and formulate measurement models based on the problems formulated on the student worksheets [8].
d. Presenting the concept created from group discussions result through class presentations then evaluating the results for consideration in the future.

Phase one, engaging students to understand the basic concepts of physical physics with the phenomena that exist in society related to physical physics and their relevance to the verse of Holy Qur'an, "We created everything in due measure and proportion". (Al Qamar: 49) [3]. After that students asked to formulate problems from various problems in the environment, students propose a concept that was created based on it then presenting the concept in front of the teacher and friends. Phase two, students

explored themselves to find and construct their process of gaining knowledge and understanding by exploring the community environment Physics physics scale to help humans in everyday life and its relevance to Islamic values. Phase three, based on students' understanding of the concepts obtained by creating a formula to answer the problems on the student worksheet given. Then the students presented the results of the discussion from data analysis and provided the solutions needed to solve problems in the surrounding environment and shortcomings to be made new at a later date. Moreover, in the final phase, the teacher gave score on students' science process by giving post questions that were reviewed from 5 domains, comprise domains concept, domain processes, domain applications, domain creativity, and attitudes. STS learning was integrated with religious values that allowed students to think critically in problems solving, students be interested because the concept was integrated with religious values and opened students' insights to get out of the understanding that physics was a lesson that memorizes formulas only. STS learning was integrated with religious values that can be obtained because students were stimulated to look deeper into the subject matter because of its relevance to society and religious environment technology as an indication of a problem phenomenon and its problem solving. So that students were active independently to construct their knowledge through observing various phenomena in the society environment [6].

4.4.1 Social system

The social system that refers to this model approach was students form heterogeneous groups that allowed students to be able to have friends with different backgrounds. The effect for students received when reflecting on the integration of Al-Quran verses causes students to be active and curious about the relevance of religion and science so that the understanding of religion and science as two different aspects were broken. Students were expected to be knowledgeable and also believers on Religious, so it would be easy in building a relationship with the surrounding environment and society can be achieved [10].

4.4.2 Reactionprinciple

The principle of reaction in the STS Learning Model integrated with religious values was the teacher role as a facilitator who facilitates students in constructing their knowledge by providing basic understandings that related to religious values and science. Teachers form heterogeneous groups, thus it treated students to adapt to society with different backgrounds, teachers motivate students to provide positive feedback to develop student competence [9].

4.4.3 Supportingsystem

The support system that must be fulfilled in implementing the integrated STS approach model of religious values was teachers had to have good knowledge of religious and science and relevant, specific, and actual material to develop instruments. Also, students had to be active to find their knowledge through various supporting literature [13].

4.4.4 Instructionalimpact

The instructional impact of the STS learning model integrated with religious values comprises students were able to construct and associate their knowledge, treated scientific thinking skills in problems in the surrounding environment. This was in line with the cognitive capacity of students

4.4.5 Indirect impact

The indirect impact of the integrated STS approach model of religious values comprises students took an active role in the learning process, thus they were able to construct their knowledge process with the natural phenomena around them. Students who were able to be disciplined and work together with heterogeneous group members in order to prepare students' mentality to go directly to the environment and society and be actively involved in building relationships [12].

4.4.6 Science Skills process in STS integrated with the learning model of religious values

Students' science skills include 5 domains, comprise domains of concept, processes, applications, creativity, and attitudes which can be fulfilled in the STS approach model integrated with religious values. The domain concept includes facts about a particular theory. The domain process was focused on how the process of students acquiring knowledge, classifying, measuring, inferencing, regarding variables, interpreting from formulating hypotheses, communicating, defining operations and conducting experiments, and communicating. The domain of applying concepts and skills to solve everyday problems. The domain of creativity in students' imagination, intuition and elevation. The domain includes students' attitudes towards science, religion, environment, society, and themselves [9].

V. CONCLUSION

This study aims to produce an STS learning model that is integrated with religious values and their influence on students' science process abilities. The learning model developed is practical, valid, and effective to improve the science skills process of students at Al-Hasan High schoolJember. The average score of science process skills

of students who were given STS treatment with integrated religious values was 78.80 with a proportion that was by the minimum criteria of learning completeness of 70% of the total 35 students. Researcher's suggestions for teachers not to teach in a dichotomy, which is wrong between science, technology, society, and religion, all of which are related to forming a product that is useful for students in the community in the future, both in social, knowledge, and religious aspects.

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