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Kaunyah verse-based science learning: reconstruction of the 21th century science learning program

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Abstract. This study aims to determine the effectiveness of the Kaunyah Verse Based Science Learning (KVBSL) program in optimizing student scientific communication skills. The KVBSL program is the result of the reconstruction of science learning in accordance with 21st century learning and it integrates the Islamic values stated in the Al-Qur'an. It employed developmental research. The population of this research was 436 students at three colleges, and it assigned 112 students by using cluster random sampling. The data was obtained through observation and test. It, then analysed by using t-test formula. The results showed that the KVBSL program significantly improved students' scientific communication skill. It was characterized by: 1) the scientific communication skills is increased significantly ($\alpha=0,05$); 2) there is consistent improvement of scientific communication skills in each college; 3) among the aspects of scientific communication skills, the highest average score is on the ability of representation and scientific writing.

1. Introduction

Science learning that is oriented on the 21st century learning is the learning that elaborate elements of critical thinking skills, problem solving, communication and collaboration in every learning activity [1]. An important element of science learning is being able to understand the science concepts and steps of the science experiment and be able to communicate that knowledge to others. Communication skills are always involved in science learning activities, especially science as a scientific product (facts, concepts, principles, laws, and theories). This shows that communication has an active role to arouse people's interest in understanding science and facilitating scientists with the community in scientific activities and sharing insights about science.

Pre-service science teacher must be able to prioritize communicative activities in sharing scientific information to others. The importance of student communication in science learning can change the learning situation towards the better so that the interaction between students with students, students with teachers and students with the environment in conveying the process of thinking [2]. Based on the results of observations on the lesson plan of the science lecturers on methodology course, there were no plans for learning activities that emphasized scientific communication skills. The results of this planning finally have implications for the implementation of learning in which communication occurred during learning is still dominated by lecturers (72.6%), while the proportion of communication made by students is still lacking (27.4%). From the results of these observations, it shows that the lectures on the science learning methodology have not able to facilitate students in communicating science. Therefore, management of learning that emphasizes an effective communication process is considered important because it can develop the potential of students to be



able to think reflective and communicative in solving problems. One way to be able to have reflective and communicative thinking skills is to learn through the verses of the Al-Qur'an, especially the verses of kauniah that are in accordance with the construction of the science due to the existence of discussion of the problem of nature in the Al-Qur'an.

Science is a value-free dimension, so efforts to develop science and religion in an integrative manner in Indonesian should be based on religious values from the beginning, so that religion will become the spirit for the construction of science and technology that will be explored or developed by Islamic university. With such perspective, will not only be able to develop more innovative science and technology, but also be able to shape Islamic brand design from the characteristics of the science and technology it develops, as an effort to strengthen the existence of Islamic university in Indonesia[3].

The Al-Qur'an is a human guide to living life in the world, and also as a source of law and knowledge. This makes the Al-Qur'an occupy a prime position in the life of Muslims. For example, in terms of Allah's command on one of the verses of kauniah, namely Al-Alaq verses 1-5 that commands humans to always learn and think. *Iqra'* which means reading is the main foundation in education for humans. The verse gives information as well as a command that humans must learn, so they know what they did not know. The verse ontologically contains messages related to objects, goals and objectives of education. In the second verse, it gives information on the importance of understanding the origin of living things. In this verse it appears that Allah explained to humans about Natural Sciences. The third verse, there is a repetition of the word *iqro'*, this is closely related to the command to develop knowledge comprehensively. In the fourth and fifth verses there is the term *qalam*, which is not only limited to writing instruments but tends to mean the method or method of learning. So that in carrying out everything must be done based on relevant to scientific method. The verse also contains the source of knowledge that any discipline of the source of knowledge is Allah Swt[4]. The letter of Al-Alaq verse 1-5 implies Allah's command to 1) study seriously, 2) think about His creation (natural science), 3) develop knowledge comprehensively and holistically, 4) employ tools / methods certain to learn, and 5) believe that God is a source of knowledge

As Muslims, the Al-Qur'an is a life guide on how humans relate to Allah, human to human, human to the nature. Therefore, in learning science that concern on the relationship between humans (educators) to humans (students), and human relations (educators and students) to the nature (greatness of God Almighty) is require to integrate the values and instructions in the verses Al-Qur'an in order to improve the learning pattern of science that has been going on so far. Referring to the importance of the Al-Qur'an as a guide, command, value, and source of knowledge for humans in learning activities, especially in learning knowledge of nature, it is deemed to integrate kauniah verses as a means of reflective thinking in optimizing science learning. One of alternative learning program that can foster reflective thinking in the 21st century science learning that integrate Islamic values is the Kauniah Verse Based Science Learning (KVBSL). This program emphasizes reflective activity in reviewing nature as an evidence of the greatness of Allah SWT. Furthermore, by using communication theory which is used as the basis for developing the KVBSL model, it can strengthen the meaning of knowledge from the results of reflective thinking by conveying the Islamic message to others through communication. Given the importance of communication in optimizing the meaning of Qur'anic knowledge and helping the process of skills-oriented learning in the 21st Century, a study was conducted to determine the effectiveness of the KVBSL program in improving scientific communication skills of pre-service science teacher.

The KVBSL program offers a form of science learning reconstruction that is tailored to the demands of 21st century skills by prioritizing the contents of the Al-Qur'anic values in their learning. This method can be used as an alternative solution to the implementation of integrated constructive science learning lectures. Learning according to constructivist theory is the process of building knowledge through interaction with the environment[5]. The learning method is carried out through the construction of knowledge sourced from the verses of the Al-Qur'an based on the cognitive schemes of understanding science by students. Learning activities are directed at making the Al-Qur'an containing signs about the secrets of nature and guidance for humans to be explored in the context of science learning not on science-based content. The KVBSL method is constructed from several

educational theories, such as constructivist theory, cognitive theory about information processing, and communication theory.

Learning according to constructivist theory is the process of developing knowledge through interaction with environment. So that learning will be meaningful if students are able to build their own knowledge, attitudes and skills through interaction with the learning environment. The constructivist view also addresses the process of delivering information, where constructivist views provide important input to support learning through dual coding theory. This theory explains that the delivery of information presented visually and verbally will be remembered better than information that is only presented in one way [6]. It entails that the learning process utilizes visual learning facilities. This visual tool can be formed by presenting the verse along with a visual image of the interpretation of the verse, then the interpretation image is discussed through scientific studies of science education.

Other theories supporting of the KVBSL method are cognitive learning theory, which views the learning process from information processing activities. This information processing starts with the way information is received in various senses, transferred to short-term and long-term memory. Information undergoes a flow of transformation in the human mind until the information is permanently stored in long-term memory in the form of knowledge packets [7]. In the process of implementing the KVBSL program, students use certain learning themes which are then searched for information sources from the Al-Qur'an. Here the role of the verse of the Al-Qur'an is as literacy in discussing that particular theme.

The view of communication theory in learning explains that optimal success can be achieved in learning activities when a process is established to build effective communication relationships between teachers and student. In the process, to establish effective communication needs to present problems related to a theme to be discussed. The theme can be studied by reading the divine instructions on one of the verses in the Al-Qur'an. The theme associated with the divine guidance can motivate human reason to reflect on the truth from the eyes of the scientific process, and be able to bring the principles of Islamic teachings closer to the human soul. Besides that, the communicative relationships that are intertwined in studying these divine instructions will strengthen the delivery of Islamic treatises to Muslims / Muslims. Delivery message reinforcement can also be done by giving scientific cues concept through the integration of science and interpretations such as the science-Tafseer learning model [8].

Based on the construction of several theories, the steps of the KVBSL method can be explained as follows: First, mapping the concept of science learning. Students are invited to classify material about science learning systematically into various disciplines or selected themes using a material integration map. In other words, lecturers are advised to first explore the themes of science learning in accordance with the nature of science. Second, integrating scientific and Islamic concepts. It integrates the concept, namely finding the point of similarity between science learning in accordance with the nature of science and the word of Allah in the Al-Qur'an. This means that between the Al-Qur'an and science learning are tried to be integrated so that each other strengthen each other in understanding of concrete reality in accordance with Islamic values. Third, making the Al-Qur'an as a guardian of every science work. Al-Quran is not just a complement, but a reference source. Lecturers need to discuss with lecturers of other subjects instilling Islamic values contained in the Al-Qur'an in each theme discussed. Fifth, communicate the Islamic treatise effectively to others through the Al-Qur'anic reasoning process with a review of science learning. In this last stage the Lecturer facilitates students to be able to communicate the results of their studies to others.

Communication in science learning emphasizes learning to understand and learn scientific language through the implementation of learning principles [9]. In communicative conception, scientific communication is the continuous transfer of knowledge of physics and methods into the mind. The use of scientific communication in learning is a learning process to build scientific meaning by involving interpersonal interaction activities, critical assessment, and dialogue. Through communicative science learning, students will be given space to transfer knowledge so that they can realize science knowledge that was originally abstract to be easier to digest. Avargil et al. [10] classifying communication skills into: 1) scientific reading; 2) observing; 3) scientific writing; 4) representing; and 5) presenting knowledge.

2. Methods

This research was experimental study with a randomized pre-test post-test control group design, which aims to determine the effectiveness of products resulting from science learning reconstruction, namely KVBSL program on student science communication skills. The study was conducted in several institutions with a sample of students of pre-service science teacher who were teaching science learning methodologies. The research will be conducted in several institutions with a sample of students of pre-service science teacher who are currently teaching science learning methodology. The study was conducted in several districts in the East Java region. The research population consisted of 436 students with 112 students as samples from three institutions. Sampling in each institution is done through cluster random sampling while the selection of institutions is done through purposive sampling based on predetermined criteria, namely based on the distribution of the area and culture of the community. The institution taken is a representation of several Islamic religious colleges in East Java, both state and private. The selection of the three institutions is based on the characteristics of pre-service science teacher with various cultural cultures and the distribution of representation of the region in East Java. With the variety of characteristics in each institution, the research data produced is more diverse and it is expected that the level of product testing will be better.

3. Results and Discussion

In order to determine the effectiveness of the reconstructed lecture program of KVBSL program is carried out through evaluation and assessment of scientific communication skills. The purpose is to determine the improvement of scientific communication skills before and after learning using KVBSL. The results were presented in the form of the value score of the ability to communicate science in each indicator. It was then tested in three colleges, namely STAIM Nganjuk, IAIN Ponorogo, and STITNU Al-Hikmah Mojokerto. The pilot campus shows that the data produced is normal and homogeneous, so that to determine its effectiveness, parametric statistics can be tested. To find out the effectiveness, namely 1) ANOVA test, to determine whether there are differences in the increase in each campus sample, 2) t-test one sample, to determine whether there is an increase in each sample, 3) two t-test samples, to see a comparison of improving communication skills between the three colleges. The first statistical test is the ANOVA test on the data value of scientific communication skills in all sample colleges. ANOVA analysis was performed using *Minitab 16* which produced the following findings.

Table 1 Anova Test for OnePath

Data	Class	α	Sig.
Gain of Normalized	STITNU Al-Hikmah Mojokerto IAIN Ponorogo STAIM Nganjuk	0.05	0.000

The result of ANOVA test in Table 1 is that *P-Value* at 0,000. This means that the value is lower than the significant value of α (0.05). It can be inferred that the three data are similar in improving communication skills in science learning.

The next statistical test is a sample t-test. In this test each campus was seen as having no improvement in scientific communication skills. From the results of the analysis using *Minitab 16*, the results of data processing is as follows.

Table 2 t-Test One Sample in Three Colleges

Data	Class	α	Sig.
Gain	STITNU Al-Hikmah Mojokerto	0.05	0.000
Gain	IAIN Ponorogo	0.05	0.000
Gain	STAIM Nganjuk	0.05	0.000

The results of these statistical tests show that the three colleges showed that *P-Value* is 0,000 and it is lower than the value of α (0.05). It indicates that there is an increase in the value of scientific

communication skills throughout the sample campus. The last statistical test is the two t-test sample, this is done to see a comparison of the improvement in communication skills between sample colleges. The next test is to determine an increase in comparison between the pilot classes II. Statistical tests are carried out between sample colleges. The following are the results comparison between STAIM Nganjuk and IAIN Ponorogo is as follows.

Table 3 Two t-test Samples between STAIM Nganjuk and IAIN Ponorogo

Data	Class	α	Sig.
Gain	STAIM Nganjuk IAIN Ponorogo	0.05	0.458

Table 3 showed the comparison in communication skills in science learning between IAIN Ponorogo and STAIM Nganjuk. The result showed that the *P-Value value* is greater than the value of α (0.05) at 0.458. It indicates that there is no difference in communication skills between those two colleges. The result of communication skills comparison in STAIM Nganjuk with STITNU Al-Hikmah Mojokerto can be seen as follows.

Table 4 Two t-test Samples between STAIM Nganjuk and STITNU Al-Hikmah Mojokerto

Data	Class	α	Sig.
Gain	STAIM Nganjuk STITNU Al-Hikmah Mojokerto	0.05	0.973

Table 4 showed the comparison in communication skills in science learning between STAIM Nganjuk and STITNU Al-Hikmah Mojokerto. The result showed that the *P-Value value* is greater than the value of α (0.05) at 0.973. It indicates that there is no difference in communication skills between those two colleges. The result of communication skills comparison in IAIN Ponorogo with STITNU Al-Hikmah Mojokerto can be seen as follows.

Table 5 Two t-test Samples between STITNU Al-Hikmah Mojokerto with IAIN Ponorogo

Data	Class	α	Sig.
Gain	IAIN Ponorogo STITNU Al-Hikmah Mojokerto	0.05	0.970

Based on the results in Table 5, it can be seen that the *P-Value value* resulting is greater than the value of α (0.05), this indicates that there is no difference in the STITNU Al-Hikmah Mojokerto and IAIN Ponorogo.

The effectiveness of the KVBSL lecture program implementation can also be seen from the score of the acquisition of scientific communication skills on each indicator. The acquisition score of scientific communication skills is as follows.

Table 6 Comparison of Performance Score Indicators of Communication Skills Science

Indicator	Colleges		
	STAIM Nganjuk	IAIN Ponorogo	STITNU Al-Hikmah Mojokerto
Reading	3.2	3.1	3.0
Writing	3.3	3.2	3.0
Representation	3.3	3.2	3.2
Presentations	3.2	3.0	2.9
Observations	2.9	3.2	2.9
Average	3.2	3.1	3.0

Table 6 shows that the average score obtained in the ability to communicate science on campus experiments obtained the value is in a good category with an average of 3.1. From data, the highest average was obtained by STAIM Nganjuk with a score of 3.2, then IAIN Ponorogo with an average

score of 3.1 and the next was STITNU Al-Hikmah Mojokerto with an average value of 3.0. Judging from the indicators, the highest score for STAIM Nganjuk is on the indicator of writing and representation, and the lowest score on the ability of observation. At IAIN Ponorogo, obtaining the highest score is almost the same as STAIM Nganjuk where writing ability and representation both get the highest score, but differ for the lowest score, where the presentation ability only scores 3.0 or the lowest compared to other abilities. The score of acquisition in STITNU Al-Hikmah Mojokerto shows that the highest score of ability is representation ability, but the ability of presentation and observation get the lowest score compared to other indicators. Overall, on campus given three times the same requirement, the highest average score is on the ability of representation and scientific writing. According to Taylor et al. [11] representation has a role in increasing the effectiveness of communication, a tool to construct ideas, overcome cognitive barriers, and as a means of connecting between concepts. So that the high representation shows that the implementation of the KVBSL program has succeeded in helping students construct scientific signals obtained from the verses of the Al-Qur'an and more abstract to concrete in the form of science learning activities. The next highest score is scientific writing skills, which are an important part of science lessons. According to Toppen [12] skilled writing can help someone to organize their thoughts and find meaning from a finding for reflection for themselves and convey it to others. By having the ability to write scientifically, students can describe and discuss a problem and pour it in a systematic and structured manner. While the lowest value is the ability of observation and presentation, but still in the good category.

4. Conclusion

Based on the findings, it can be inferred that the science learning program reconstructed into the KVBSL or Kaunyah Verse Based Science Learning program can improve science communication skills of pre-service science teacher. This is due to several reasons, namely: 1) there is an increase in consistency of the three colleges as research sample, 2) the improvement of significant communication skills in each indicator, especially in the ability of representation and scientific writing.

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