

Assessment can be Applied to the Science Technology Engineering Mathematic and Alqur'an Learning Approach?

Sistiana Windyariani^{1,a}, Andri Moewashi Idharoel Haq^{1,b}
{windyariani@gmail.ac.id^a, andrimoewashi@gmail.com^b}

¹Universitas Muhammadiyah Sukabumi, Jawa Barat Indonesia

Abstract. Science Technology Engineering Mathematics approach learning, is an alternative learning that can build a generation that is able to face the full of challenges 21st century. The STEM learning approach is able to train students both cognitive, skills and affective. This research study aims to examine the types of assessments that can be used in the STEM learning approach by adding the Qur'an as the context of the problem, so that in this study referred to as the STEMA learning approach (Science Technology Engineering Mathematics and Al-Qur'an). When applied STEMA learning approaches can be assessed student ability that appears during the process and learning outcomes. To assess STEMA knowledge and learning outcomes, test instruments can be used and are known as traditional assessments, while the components of science, technology, mathematics and the Qur'an are used as context of the problem. To assess skills can be used performance assessments and observation sheets. For assessing affective questionnaires sheets can be used. The results of the study obtained are expected to be a picture for educators who will apply the STEMA learning approach by using the types and methods of assessment variation.

Keywords: Assessment, Science Technology Engineering Mathematic and Al-Qur'an learning approach.

1 Introduction

Technological advances in the digital era that lead to the millennial era must be addressed seriously, mastering and controlling the role of technology properly so that this era can bring benefits to life. This remarkable technological progress has made it easier for people to live their lives, but on the other hand, very rapid developments have also contributed to many changes in the way of life, and these changes are not always positive.

The era is increasingly changing, the character of the generation that lives in each period also changes. There are five generation periods based on the year of birth, including the baby boomer generation born in 1946-1964, generation X born in 1965-1976, millennial generation born in 1977-1995, generation Z or millennial born in 1996 -2010 and the Alpha generation born in 2010 to the present [1]. Teachers and prospective teachers in the year of birth face generation Z and Alpha, where the similarities between them were born in an era where everything can be accessed by the internet so that it is easy to get information without having to bother asking others, looking for books or referral sources, active on social media, have a high level of curiosity but if not closely monitored with unfavorable things (for example, pornography, violence, etc.), are also more critical because they are able to find information easily.

The challenges of the millennial era are at hand. Teachers and prospective teachers and other educational stakeholders should be literate about this condition. Learning objectives have changed from conveying the content of information to building student character. There has been a shift in the role of the teacher's task of not only teaching but understanding interpersonal dynamics in classroom assessments and establishing good partnerships with students and determining valuable learning outcomes and transferring them into quality assessments.

STEM (Science Technology Engineering Mathematics) learning, is currently an alternative science learning that can build a generation that is able to face the 21st century full of challenges [2]. STEM refers to teaching that is collective and across disciplines including science, technology, engineering, and mathematics. STEM is learning developed in developed countries such as America, Japan Finland, as well as Taiwan, China and even Malaysia and there is no harm in Indonesia applying it by adjusting existing conditions [3]. If it is associated with the condition of a nation that is increasingly moral crisis, students with characters in generations Z and Alpha, the negative influence of technological progress, and curriculum demands to instill character values, the application of learning to integrate the values contained in the Qur'an is very possible in STEM learning.

STEMA (Science Technology Engineering Mathematics and Al-Qur'an) is a STEM teaching concept that integrates values in the Qur'an as content to strengthen the character and personality of students [4]. In the STEMA concept the dimensions of the learning process include, content, process, context and the Qur'an. The process of integrating Al-Qur'an values in STEMA learning can be done in various ways. Some Islamic universities have developed models of scientific integration that substantially, together integrate religious and general sciences, and eliminate the dichotomy between the two scholars [5].

However learning will not be separated from the assessment. Asesmena is every procedure used to obtain information about student performance. Includes traditional paper-and-pencil tests and also broad responses (for example, essays), and authentic task performance (for example, laboratory experiments). The assessment answers the question: "How well does the individual perform?" [6]. In any learning procedure accuracy and quality of measuring instruments will determine the information obtained [7]. So that every teacher needs to be careful in determining, selecting and compiling a measuring instrument that will be used in every learning.

Based on this explanation, a research study that is aimed at providing an alternative picture of the types and methods of assessment that can be used in STEMA learning. The results of the study obtained are expected to be an illustration for teacher who will apply the STEMA learning approach using various types and methods of assessment.

2 Discussion

In the process of education, assessing and making decisions about assessment or what is known as evaluation is a very important part of knowing a student's position and learning progress. In Islamic evaluating activities are listed in the letter of Al Hasyr verse 18. Allah SWT says: "*O you who believe, fear Allah and be mindful of what He has done for tomorrow (and the Hereafter), and fear Allah, verily Allah knows best what you do,*" Al-Hasyr 59:18.

The contents of Al-Hasyr verse 18 of the letter, from the point of view of learning assessment has at least four implications about the basis of learning evaluation theory. The

first is the pedagogical value, the intention is assessment with the intention of assessing development and coupled with feed back by the teacher to motivate students to increase their acquisition in learning is an Islamic educational value that leads to improving the quality of human resources. The second is the value of Islamic ethics, Al-Qur'an Surah Al-Hasyr verse 18 explains that Allah SWT suggests that every believer man pays attention to everything he has done, in the context of evaluation it is highly correlated to the measuring instrument of evaluation, including observation, questions , self-report interviews, which can give a good and bad picture of a person, so that if the results are good as far as possible be maintained or temporarily improved if the value is bad then it is corrected. The third is the Islamic aesthetic value, the value of beauty can be realized in the form of motivation from students who emerge when the teacher gives an assessment, students who have superior values will feel the wisdom of excellence obtained, while students who have not excelled will be encouraged to learn better. The fourth is the value of Islamic logic, about God's call to people who believe to want to introspect on his actions so that he becomes a better human being according to the guidance of the Qur'an and Sunnah.

In assessing students through STEM learning that is integrated with the values in the Qur'an can be done to assess the results and learning process. To assess knowledge as a result of STEM learning, it can use a test instrument and is known as a traditional assessment. The test itself is an instrument or tool that can be used to measure a person's knowledge or skills in order to obtain information [7] [8]. The test consists of a description test (subjective) and an objective test. Subjective tests require students to remember, understand, and organize their ideas or things for what they have learned, by expressing or expressing these ideas in written form using their own words. The objective test is a test which can be carried out objectively in the examination [8]. Objective tests can be divided into five types, namely: (1) true-false forms of objective tests (True-False Tests), (2) Matching Tests, (3) fill-in objective tests, (4) objective forms of completion tests, (5)) multiple choice item objective test [7] [8].

In assessing students through STEM learning that is integrated with the values in the Qur'an can be done to assess the results and learning process. To assess knowledge as a result of STEM learning, it can use a test instrument and is known as a traditional assessment. The test itself is an instrument or tool that can be used to measure a person's knowledge or skills in order to obtain information [7] [8]. The test consists of a description test (subjective) and an objective test. Subjective tests require students to remember, understand, and organize their ideas or things for what they have learned, by expressing or expressing these ideas in written form using their own words. The objective test is a test which can be carried out objectively in the examination [8]. Objective tests can be divided into five types, namely: (1) true-false forms of objective tests (True-False Tests), (2) Matching Tests, (3) fill-in objective tests, (4) objective forms of completion tests, (5)) multiple choice item objective test [7] [8] In making tests in the STEMA learning approach for the components of science, technology, engineering, mathematics and the Qur'an are used as the context of the questions. This is very possible because in the Qur'an there are 750 verses kauniyah namely verses about the universe [9]. The phenomenon of the rising of the sun, the circulation of the moon and the twinkling of stars, and the occurrence of rain, various verses about plants, livestock, and wild animals that are scattered on earth and various other natural phenomena and wonders.

As for the preparation of STEMA questions, which are carried out: 1) Determine the limits of the material to the material to be made a learning design test (in Curriculum K-13 can be determined from the Core Competencies-Basic Competency-Indicators), 2) Determine the context of Science, Technology, Engineering, Mathematics and Al-Qur'an (can be used as a whole context, if not possible context is chosen), 3) Arrange STEMA indicator indicators as

an inseparable part of the learning plan, 4) Arrange the subject matter in the specification table, 5) Write items . The following table 1 contains examples of knowledge about instruments to access knowledge in STEMA learning.

Table 1. Examples of Basic Competencies and Questions for STEMA

Basic Competencies	Domain	STEMA context	Contoh Soal STEMA
Class XI 3.6 Analyzing the relationship between the structure of tissues making up organs in the circulatory system in relation to bioprocess and impaired function that can occur in the human circulation system	Cognitive C4	Science Mathematic Qur'an	Why is the best time to read the Qur'an at the end of dawn or after Maghrib prayer?
Class XI 3.9 Classifying animals into phyla based on body layers, body cavities, body symmetry, and reproduction	Cognitive C4	Science Technology Mathematic Engineering Qur'an	<p><i>"And your Lord revealed to the bees: "Make hives in the hills, in the trees and in places made by men" (Surah An-Nahl 68).</i></p> <p>Bees are very special insects. Besides being the only honey-producing living creature that has millions of bee benefits, it is well known for its ability to make nests that are also used as a place to store honey. Today more and more architects make buildings by imitating the shape of a beehive and many experts suggest that building a building that follows the honeycomb concept is a more cost-effective place and place in human times that is increasing. Why do you think so?</p>

Table 1 shows an example of a STEMA problem with essay type questions. For the needs of other STEMA questions, you can also use other types of test questions. Someone who is STiterititerated has several characteristics, including: 1) Being able to identify questions and problems in life situations, and drawing evidence-based conclusions related to STEM issues, 2) Understanding the characteristics of STEM discipline characteristics as a form of knowledge, investigation, and human design; 3) Awareness of how STEM disciplines shape our material, intellectual and cultural environment; and 4) Willingness to get involved in issues related to STEM and with ideas of science, technology, engineering, and mathematics as constructive, caring, and reflective citizens [10].

To assess the learning process, an assessment that might be used is a performance assessment to assess skills. Performance assessment research can be done to assess STEMA learning [10]. Students can learn through project-based learning with the advantages of STEM there are thought processes, designs, builds, and tests that emphasize the engineering or engineering stages, but still in line with the scientific process (scientific process). As for examples of STEMA questions in the psychomotor domain are as follows:

Table 2. Example of STEMA task to measure skills

Basic Competencies	Domain and assessment	STEMA context	Contoh
Class VII 4.10 Menyajikan karya tentang proses dan produk teknologi sederhana yang ramah lingkungan	Psychomotor (manipulation) Performance assessment process and product	Science Technology Mathematic Engineering Qur'an	<i>It has been seen that damage on land and on the sea is caused by the deeds of human hands, so that Allah feels to them part of their actions, so that they return (to the right path). (Ar Rum: 41)</i> Ecobrick is now increasingly popular and is seen as a simple solution to save the world. Make with your group a product design using ecobricks to reduce the amount of waste around you!

Performance assessment is in accordance with the characteristics of STEM education implementation, because the assessment of learning outcomes in the context of STEM-based science learning needs to focus more on authentic assessments, especially performance assessments [11]. Performance appraisal using a well-designed rubric needs to be done by teachers, friends, and students themselves on the performance of students during learning activities and products of collaborative work to uncover the achievement of standards for learning outcomes.

In addition to skills, to assess the learning process in the form of an attitude as explained earlier that to balance the speed of technological development and train students' character and make an intensive approach to students, attitude scale instruments can be used to capture attitudes in the face of the development of science, technology, engineering mathematics and the Qur'an, and personal communication especially to assist students in the millennial era. In addition, soft skills can also be assessed (including communication, cooperation, leadership. [11])

The STEM learning approach that combines science, technology, engineering and mathematics has a lot to foster students' interests and concepts in science learning [12] [13]. STEM learning is also appropriate in the 21st century [3]. But STEM learning that does not present value (in the Qur'an) will lose its meaning in forming students who are character and ready to approach the 21st century.

3 Conclusion

The need for varied assessment of the cognitive, affective, and psychomotor domains in accessing STEMA-based learning by emphasizing the values contained in the Al-Qur'an to revive character values in an increasingly frenzied era with the development of technology that is unstoppable.

References

- [1] Farhati (2018), Liputan Utama Suara Aisyiyah: *Mengenal Generasi Milenial, Z, dan Alpha*. Majalah Suara Aisyiyah Edisi ke 3 Maret 2018 hal12.
- [2] Kuenzi, J. J. (2008). Science, technology, engineering, and mathematics (STEM) education: Background, federal policy, and legislative action
- [3] Permanasari, A (2106). *STEM Education: Inovasi dalam Pembelajaran Sains*. Makalah Kunci Seminar Nasional Pendidikan Sains UNS Tersedia online: <https://media.neliti.com/media/publications/173124-ID-stem-education-inovasi-dalam-pembelajara.pdf>
- [4] Setiono dan Suhendar (2018). STEMA (Science Technology Engineering Mathematic dan Al-Qur'an) dalam Pendidikan Sains. BungaRampaiLokalatihdalamPembelajaranPraktikum (Kegiatan Open Lab Biologi ke-3). Hal 1-10
- [5] Hanifah, U. (2018). Islamisasi Ilmu Pengetahuan Kontemporer (Konsep Integrasi Keilmuan di Universitas-Universitas Islam Indonesia. *TADRIS: Jurnal Pendidikan Islam*, 13(2), 273-294.
- [6] Gronlund, N. E., & Linn, R. L. (1990). *Measurement and Evaluation in Teaching*. Sixth Edition. New York: MacMillan Publishing Company.
- [7] Rustaman, N. Y. (2004). Asesmen Pendidikan IPA. *Bandung: Diklat NTT04. Tersedia di [http://www.file.upi.edu/\[diakses 12-2-2015\]](http://www.file.upi.edu/[diakses 12-2-2015])*.
- [8] Arikunto. Suharsimi. 2013. *Dasar-Dasar Evaluasi Pendidikan edisi kedua*. Jakarta: Bumi Aksara
- [9] Purwanto, A. (2015), *Ayat-Ayat Semesta*. Bandung: Mizan
- [10] Septiani (2016). *Penerapan Asesmen Kinerja dalam Pendekatan Stem (Sains Teknologi Engineering Matematika) untuk Mengungkap Keterampilan Proses Sains*. Seminar Nasional Pendidikan dan Saintek 2016 (ISSN: 2557-533X)
- [11] Firman, Harry. (2015). Pendidikan Sains Berbasis Stem: Konsep, Pengembangan, Dan Peranan Riset Pascasarjana (Possition paper: Seminar Nasional Pendidikan IPA dan PKLH Program Pascasarjana Universitas Pakuan. Agustus 2015. Tersedia online: https://www.academia.edu/download/42156168/Firman_Full_Paper_PPS_U_NPAK.docx

- [12] Pangesti, K. I., Yulianti, D., & Sugianto, S. (2017). Bahan Ajar Berbasis STEM (Science, Technology, Engineering, and Mathematics) untuk Meningkatkan Penguasaan Konsep Siswa SMA. *UPEJ Unnes Physics Education Journal*, 6(3), 53-58. Tersedia online. <http://journal.unnes.ac.id/sju/index.php/upej>
- [13] Sudirman, S., Kistiono, K., & Taufiq, T. (2018). Pengembangan Modul Mata Kuliah Gelombang Berbasis Stem (Science Technology Engineering And Mathematics) Pada Program Studi Pendidikan Fisika. *Jurnal Inovasi dan Pembelajaran Fisika*, 5(2), 134-140. Tersedia online. [Ejournal.unsri.ac.id.index.php](http://ejournal.unsri.ac.id/index.php).