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THE QUALITY OF PRE-SERVICE PRIMARY TEACHER'S 21ST CENTURY SKILLS-BASED ETNO QUR'ANIC STEM E-MODULE THROUGH AN ALESSI AND TROLLIP MODEL

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Abstract

Technological challenges in the era of Industrial Revolution 4.0 in the educational sector require higher human resources to prepare the competencies of the next generations and be able to follow the development of teaching materials that still consider regional culture by using technology. In facing these challenges, this study aims to generate the design of an Ethno Qur'anic STEM-based E-module as teaching materials in the concept of Science, which is able to integrate and interconnect Islamic values, local Acehnese wisdom, and technological science, which are appropriate and practical for prospective elementary school teachers so that they are able to compete in this 21st century. The type of this study was Research and development with Alessi and Trollip development model design. The development steps were: (1) planning; (2) design; and (3) development. Data analysis used the alpha test as a validity assessment, which showed the feasibility of e-module development, and the beta test as the assessment of e-module practicality. The results obtained based on the assessment of media, material, and Al-Quran experts showed that the Ethno Qur'anic STEM-based E-module is really feasible with a value of 86.63% and really practical with a value of 88.87% to be used by teachers in the learning process of the concept of Science in elementary school. This paper is expected to contribute positively to improving the quality of education for prospective elementary school teachers by developing a learning module that is innovative and relevant to the needs of the time.

Keywords: *e-module; Ethno qur'anic; Ethno STEM; the concept of elementary school Science.*

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Abstrak

Tantangan teknologi pada era revolusi industry 4.0 dalam dunia pendidikan menuntut sumber daya manusia yang lebih tinggi dalam menyiapkan kompetensi generasi mendatang dan mampu mengikuti perkembangan bahan ajar yang tetap memperhatikan kebudayaan daerah dengan memanfaatkan teknologi. Menghadapi tantangan tersebut maka penelitian ini bertujuan untuk menghasilkan desain E-modul berbasis Etno Qur'anic STEM sebagai bahan ajar pada konsep IPA yang mampu mengintegrasi-interkoneksikan nilai-nilai keislaman, kearifan lokal Aceh, dan sains teknologi yang layak dan praktis bagi calon guru sekolah dasar sehingga mampu untuk bersaing di abad ke-21. Jenis penelitian ini adalah Research & Development dengan desain model pengembangan Alessi dan Trollip. Langkah-langkah pengembangannya yaitu: (1) perencanaan; (2) desain; dan (3) pengembangan. Analisis data menggunakan uji alpha sebagai penilaian validitas yang menunjukkan kelayakan pengembangan e-modul serta uji beta sebagai penilaian kepraktisan e-modul. Hasil penelitian diperoleh berdasarkan penilaian ahli media, materi dan Al-Quran menunjukkan bahwa E-modul berbasis Etno Qur'anic STEM sangat layak sebesar 86,63% dan sangat praktis sebesar 88,87% untuk digunakan oleh guru dalam proses pembelajaran konsep IPA di sekolah dasar. Tulisan ini diharapkan memberikan sumbangan serta kontribusi positif dalam upaya meningkatkan kualitas pendidikan calon guru sekolah dasar melalui pengembangan modul pembelajaran yang inovatif dan relevan dengan kebutuhan zaman.

Kata Kunci: *e-modul; Etno qur'anic; Etno STEM; konsep IPA sekolah dasar.*

مستخلص

كان ما يتطلب الحدود التكنولوجي لهذه عصر الصناعية 4.0في عالم التعليم أعلى من الموارد البشرية في إعداد كفاءات القادم والقدرة على التطورات في المواد التعليمية التي لا تزال تهتم بالثقافة الإقليمية من خلال الاستفادة من التكنولوجية .في مواجهة هذه الحدود، يهدف هذا البحث على إنتاج التصميم وحدة إلكترونية على العلوم والهندسة والرياضيات (Etno)القرآنية كمواد تعليمية لمفاهيم العلوم القادرة القيم الإسلامية والحكمة المحلية في آتشيه والعلوم والتكنولوجية التي تكون مجدية وعملية للمستقبلين .معلم المدارس حتى يتمكنوا من المنافسة في القرن الحادي والعشرين .هذا البحث هو البحث والتطوير باستخدام تصميم نموذج تطوير Alessiو .Trollipخطوات التطوير هي (1) : التخطيط؛ (2)التصميم؛ و (3)التنمية .يستخدم تحليل البيانات اختبار ألفا كتقييم صلاحية يوضح تطوير الوحدة الإلكترونية واختبار بيتا كتقييم للتطبيق العملي للوحدة الإلكترونية . يظهر نتائج البحث التي تم الحصول عليها بناءً على تقييم وسائل الإعلام والمواد وخبراء القرآن أن الوحدة الإلكترونية المبنية على Etno Qur'anic STEMمجدية جدًا بنسبة 86.63%وعملية جدًا بنسبة 88.87%لاستخدامها من قبل المعلمين في عملية التعليم . مفاهيم العلوم في المدارس .ومن المأمول أن توفر هذه المقالة مساهمة إيجابية ومساهمة في الجهود المبذولة لتحسين التعليم لمعلمي المدارس الابتدائية المحتملين من تطوير وحدات تعليمية مبتكرة وذات صلة باحتياجات العصرية.

الكلمات الرئسية: الوحدة الإلكترونية؛ العرقية القرآنية؛ العلوم والتكنولوجيا والهندسة(STEM) والرياضيات(Etno); مفهوم العلوم في المدرسة الابتدائية.

THE QUALITY OF PRE-SERVICE PRIMARY TEACHER'S 21ST CENTURY SKILLS-BASED ETNO QUR'ANIC STEM E-MODULE THROUGH AN ALESSI AND TROLLIP MODEL

A. Introduction

The rapid development of technology and science has become a major challenge for education in generating generations that are ready to face future changes and be positive agents of change in society. In facing these challenges, the education of elementary school teachers has a really important role in preparing prospective educators who are competent and have skills in the 21st century.[1] These skills will be the main capital for prospective educators in processing information and technology effectively.[2] Thus, they are able to keep up with the demands of changing times, which are increasingly diverse and developing in education in the era of revolution 4.0.

Education, in the era of Revolution 4.0, really requires a technology-based learning by implementing the critical thinking, problem-solving, creativity, innovative, collaboration, and communication skills. [3] These skills must be possessed by prospective educators to create effective, efficient, optimal, and meaningful learning processes for students.[4] The quality of skills in the 21st century not only has an influence on the quality of learning in the classroom but also has the ability to deal with various needs and characteristics of students through the integration of religious and cultural values in learning activities. [5] However, in its implementation in the field, prospective educators find a gap between the learning curriculum and adjustments to the demands of changing times in facing a competitive and dynamic future.

The conditions above show that educators must be able to understand how to implement or apply the scientific concept or science literacy in the learning process.[6] Therefore, the understanding of theories possessed by prospective educators with practical skills will be in accordance with what is required in the field. In order to overcome this problem, several previous studies have revealed that in Nigeria, prospective educators arrange the composition of the

[1] Brendan Bartanen and Andrew Kwok, "Pre-Service Teacher Quality and Workforce Entry," no. 20 (2020).

[2] Neja Markelj et al., "The Quality of Pre-Service Teacher Training during the Pandemic through the Eyes of the Slovenian Physical Education Pre-Service Teachers," *Collegium Antropologicum* 45, no. 3 (2021): 179–89, https://doi.org/10.5671/ca.45.3.1.

[3] Sudarmin Sudarmin et al., "Pelatihan Pembelajaran Proyek Terintegrasi Etno-Stem Untuk Pembuatan Teh Herbal Hutan Tropis Sebagai Imunitas Tubuh Covid-19," *Journal of Community Empowerment* 2, no. 2 (2022): 44–46, https://doi.org/10.15294/jce.v2i2.58999.

[4] Rifka Annisa and Ismail, "Filosofi Pendidikan Yang Menginspirasi: Strategi Guru Prajabatan Dalam Membangun Kemandirian Dan Kreativitas Siswa," *Jurnal Pemikiran Dan Pengembangan Pembelajaran Filosofi* 6, no. 1 (2024): 22–25.

[5] Eva Fras Juiyanti Hutasoit and Joan Hesti Gita Purwasih, "Tantangan Alumni Pendidikan Sosiologi Mengikuti Seleksi Pendidikan Profesi Guru Prajabatan," *Edukasi: Jurnal Pendidikan* 20, no. 2 (2022): 259–72, https://doi.org/10.31571/edukasi.v20i2.4453.

[6] Fitria Wulandari and Masfufah Hanim, "Model Pembelajaran Inkuiri Terintegrasi Etno-STEM Terhadap Kemampuan Literasi Sains Siswa," *JIIP - Jurnal Ilmiah Ilmu Pendidikan* 6, no. 12 (2023): 10779–86, https://doi.org/10.54371/jiip.v6i12.3121.

curriculum by providing a larger portion for the practical part compared to the theoretical part. [7] Furthermore, a study in Iran suggested that the learning process not only achieves competencies but also how an educator can interact with all students by considering the pluralistic side. According to the explanation above, the learning paradigm, by showing technology as a teaching instrument to support the learning process, becomes the solution to support 21st-century learning.[8]

The use of technology with appropriate learning models in the 21st-century era can improve the quality of learning to be more meaningful by paying attention to the student's needs individually and integrating cultural elements and students' experiences. The integration of Ethno STEM becomes one of the solutions that can integrate local science knowledge with science learning, which can be used as a learning strategy, learning media, and teaching material.[9] Considering the technological demands in the era of Industrial Revolution 4.0, besides training the concept of Science, the integration of an Ethno STEM also trains science, engineering, and technology, which still pay attention to regional culture by utilizing technology. The previous study also showed that educators must use many variations, not just combine technology and materials. [10] Therefore, in line with the function of education as a means for preserving national culture, prospective teachers have to be introduced to local culture to be used as learning sources and are expected to be able to develop students' ability to adapt and compete in the 21st century.[11]

Socio-cultural diversity in Indonesia becomes challenges for prospective teachers to combine culture and students' experiences. In the context of Aceh, culture starts with Islamic teachings because throughout the history of Aceh, the two components cannot be separated and have become an integrated unit.[12] Therefore, the development of STEM, which is based on religious values, is considered really important and relevant to be taught, especially in elementary school, because it emphasizes real practical aspects.[13] However, according to the findings in the field,

[7] Adesoji A. Oni and Titilayo I. Soji-Oni, "Pre-Service Teacher Quality And Attainment Of Teacher Education Goals In Nigeria," *Zambia Journal of Education* 7, no. 1 (2022): 31–46.

[8] S. R. Alessi, S. M., Trollip, *Computer-Based Instruction: Methods and Development* (Prentice-Hall, inc, 1984),.

[9] Nur Efendi Septi Budi Sartika*, Fitria Eka Wulandari, Luluk Iffatur Rocmah, "Efektivitas Pembelajaran IPA Berbasis Etno-STEM Dalam Melatihkan Keterampilan Berpikir Analisis," *Jurnal Pendidikan Dan Pengabdian Masyarakat* 5, no. 1 (2022): 51–57.

[10] F Reffiane et al., "Analisis Penggunaan LMS SPADA UPGRIS Pada Mata Kuliah IPA Program Studi S1 PGSD Universitas PGRI Semarang Dengan Pendekatan Etno-STEM," *Prosiding Seminar Nasional Pascasarjana (PROSNAMPAS)* 3, no. 1 (2020): 898–901.

[11] Syarifa Wahidah Al Idrus, "Implementasi STEM Terintegrasi Etnosains (Etno-STEM) Di Indonesia: Tinjauan Meta Analisis," *Jurnal Ilmiah Profesi Pendidikan* 7, no. 4 (2022): 2370–76, https://doi.org/10.29303/jipp.v7i4.879.

[12] Fauzi Ismail, "Eksistensi Kebudayaan Islam Aceh Terhadap Keutuhan Budaya Indonesia" (Proceedings Icis, January 3;1(1)., (2022), https://jurnal.ar-raniry.ac.id/index.php/icis/article/viewFile/12696/6625.

[13] Mazlini Adnan and Amirah Ayob., "Memperkasa Pembangunan Modal Insan Malaysia Di Peringkat Kanak-Kanak: Kajian Kebolehlaksanaan Dan Kebolehintegrasian Pendidikan STEM Dalam Kurikulum PERMATA Negara," *Geografia Online Malaysian Journal of Society and Space* 12, no. 1 (2016).

many prospective elementary school teachers have difficulty in integrating-interconnecting among the concepts of Ethno, qur'anic, science, technology, engineering, and mathematics (STEM) in the learning process. This is also supported by previous studies, which showed that teachers have difficulty developing products that will be produced, difficulty combining the content of natural science lessons with Ethno-STEM, and difficulty solving problems due to a lack of understanding of information.[14] Another constraint is found when Ethno STEM is developed into Ethno Quranic STEM. Prospective elementary school teachers have difficulty understanding the integration-interconnection between concepts in Ethno Quranic STEM in the education curriculum, so they consider the integration of Qur'anic STEM as a new science. [15]. In order to overcome this constraint, further efforts are required to develop a curriculum that properly integrates the concepts of Ethno Qur'anic STEM. Thus, in order to develop 21st skulls, this study becomes an important part of innovating to create sources of teaching materials in the form of Ethno Qur'anic STEM-based E-Modul in the concept of Science in Elementary School by developing Islamic social values and local values, especially Acehnese culture that will form unique prospective teachers compared to other Islamic communities in Indonesia.[16]

The use of the learning model with Ethno Qur'anic STEM is an approach combining STEM and Qur'anic interpretation through integrating-interconnecting Islamic values, local wisdom, and science and technology. Al-Qur'an contains many verses related to natural phenomena, creation, and science. In the context of STEM education, these verses can be used as an introduction or foundation to learn the concepts of science so that it is expected to be able to provide holistic, relevant, and meaningful learning processes and outcomes for elementary school students. Studies related to the development of Ethno Qur'anic STEM teaching materials have not been widely found, where the development of teaching materials is generally limited to Ethno STEM, such as the development study conducted by Asmaningrum, who made teaching materials about Ethno STEM-based environmental pollution. [17], and study by Inayah with the development

[14] Septi Budi Sartika, Nur Efendi, and Fitria Eka Wulandari, "Efektivitas Pembelajaran IPA Berbasis Etno-STEM Dalam Melatihkan Keterampilan Berpikir Analisis," *Jurnal Dimensi Pendidikan Dan Pembelajaran* 10, no. 1 (2022): 1–9, https://doi.org/10.24269/dpp.v10i1.4758.

[15] Kinasih Nike Fajar, Sahar Wardani, and Desty Putri Hanifah, "Tingkat Pemahaman Mahasiswa PGMI UNSIQ Pada Pembelajaran Berbasis ETNO-STEM.," *Prosiding SEMAI 2*, 2023, 123–29.

[16] Abdul Manan et al., "The Unity of Community in Cemetery: An Ethnographic Study of the Islamic Burial Rituals in Aceh, Indonesia," *Jurnal Ilmiah Islam Futura* 24, no. 1 (2024): 21–50, https://doi.org/10.22373/jiif.v24i1.14965.

[17] Henie Poerwandar Asmaningrum and Jusmiati Jusmiati, "Validasi Bahan Ajar Kimia Lingkungan Pada Topik Pencemaran Lingkungan Dengan Pendekatan Etno-Stem," *Jurnal Ilmiah Kanderang Tingang* 13, no. 2 (2022): 235–45, https://doi.org/10.37304/jikt.v13i2.174.

of physics teaching materials. [18] Moreover, a study reviewed by Ginanjar and Suhadi only used STEM learning integrated with the Qur'an, but it does not correlate with local cultural treasures.[19] Furthermore, a study by Ramli discussed the success of developing learning modules using STEM and respect for the Al-Qur'an.[20], and Yahaya uses STEM and the Al Quran approach to interpret celestial sphere verses. [21] According to the explanation above, further in-depth study regarding how to integrate cultural and Qur'anic values with the concepts of STEM concretely and applicatively in a learning e-module that is innovative and relevant to the needs of time is required.

The development of Ethno Qur'anic STEM-based teaching materials was designed using the Research and Development method with the development model design of Alessi and Trollip, including stages of planning, design, and development. During the process of designing and developing the learning module, it was ensured that learning materials in the module not only emphasize theoretical concepts but also integrate and interconnect 21st-century skills comprehensively and balanced. Moreover, the collaboration between cultural, religious, and education experts and technology and science developers becomes important to expand understanding and create literature and references that can support the development of Ethno Qur'anic STEM-based education effectively and relevantly. The development of this E-module is expected to provide positive contributions to improve the quality of education so that prospective elementary school teachers can be better prepared to face future educational challenges.

B. Discussion

1. Development Design of Ethno Qur'anic STEM-Based E-Modul (Product)

The development of Ethno Quranic STEM-based e-module was adapted from the multimedia development model developed by Alessi and Trollip through the following 3 stages:

[18] Riski Inayah, Prima Aswirna, and Allan Asrar, "Pengembangan E-Modul Berbasis Etno- Stem Berbantuan Canva Terintegrasi Gordang Sambilan Terhadap Keterampilan Komunikasi Peserta Didik," *JOURNAL CERDAS MAHASISWA Fakultas Tarbiyah Dan Keguruan UIN IB Padang*, (2022), 87.

[19] Gun Gun Ginanjar and Maulana Suhadi, "STEM Based Learning Development Design in 2013 Curriculum Integrated by Quran," *Pancaran Pendidikan* 7, no. 2 (2018): 125–32, https://doi.org/10.25037/pancaran.v7i2.163.

[20] Aini Aziziah Ramli and Nor Hasniza Ibrahim, "Q-STEM Module Promotes Al-Quran Appreciation in Teaching STEM," *Proceedings - 2017 7th World Engineering Education Forum, WEEF 2017- In Conjunction with: 7th Regional Conference on Engineering Education and Research in Higher Education 2017, RCEE and RHEd 2017, 1st International STEAM Education Conference, STEAMEC 201*, no. July (2018): 623–27, https://doi.org/10.1109/WEEF.2017.8466968.

[21] Amiratul Munirah Yahaya et al., "Tafsir Ayat-Ayat Falak Dalam Pembangunan Pendidikan Stem Melalui Sukatan Pelajaran Agama Di Malaysia," *Al-Qanatir: International Journal of Islamic Studies* 27, no. 2 (2022): 202.

1.1. Planning

a) Determining the scope of the study

The scope of the study in the e-module was the concept of Science. In line with the demand for education in the 4.0 era, Science-based learning is expected to develop students' ability to adapt and compete in the 21st century. [22] Besides that, based on the analysis of needs by filling out a questionnaire sheet via Google Form by lecturers and 32 students of Elementary School Teacher Education UIN Ar-Raniry Banda Aceh who were currently taking Science course for the 2022/2023 academic year, it was found that the concept of elementary school science contains a lot of physics and chemistry materials, which were considered difficult by students.

b) Identifying the characteristics of students

Identifying the characteristics of students was carried out on prospective elementary school teachers who will use an Ethno Quranic STEM-based e-module with interview and observation methods during the pre-survey. The results of the findings found that the prospective elementary school teachers were passive in seeking references related to materials being studied and only waited for materials provided by lecturers during the lectures. This is in line with the previous study, which shows that some prospective educators in Pakistan have not implemented activities encouraging cognitive activities in learning and tend to be passive.[23] Thus, the Ethno Qur'anic STEM-based e-module is designed more attractively, is not easily damaged, is more interactive, and students can access it anytime and anywhere.

c) Determining and collecting supporting sources

Collecting sources required is related to the development of Ethno Qur'anic STEM-based e-module, such as physics and science books, Islamic and science books, Al-Qur'an interpretation books, scientific articles, and other supporting references related to materials in learning the concept of Science in elementary school.

d) Initial brainstorming

This stage aims to obtain solutions to problems in elementary school students learning the concept of Science and to determine what products will be developed. Ethno Qur'anic STEM-based e-module will be solutions that are able to integrate local wisdom and Qur'an verses according to the concept of Science being studied.

[22] NFn Nurhasnah et al., "Etno-Stem Dalam Pembelajaran Ipa : A Systematic Literature Review," *Kwangsan: Jurnal Teknologi Pendidikan* 10, no. 2 (2022): 147, https://doi.org/10.31800/jtp.kw.v10n2.p147--163.

[23] Wajiha Kanwal, Iffat Basit, and Qurat ul Ain, "Development of Quality Oriented Model for Restructuring of Pre-Service Teacher Education Programs," *Review of Education, Administration & LAW* 3, no. 3 (2020): 156–73, https://doi.org/10.47067/real.v3i3.87.

1.2. Design

a) Developing ideas

In this stage, the method of presenting materials in an e-module will be combined with the concept of Science in daily life, which is in accordance with Acehnese local wisdom and integrated with STEM and Qur'an verses.

b) Analyzing concepts and tasks

In this study, the researcher analyzed the syllabus, Semester Learning Plan, determined indicators and materials, student worksheets, and media contents required in the design of the Ethno Qur'anic STEM-based e-module. Materials that will be studied in the e-module are single and mixed substances, the form of objects and their changes, temperature and heat, properties of sound, environmental pollution, the structure of earth layers and earthquakes, and natural disaster mitigation.

c) Creating flowcharts

The flowchart design, shown in Figure 1, aims to show the structure or components of the e-module from the beginning to the end of the program.

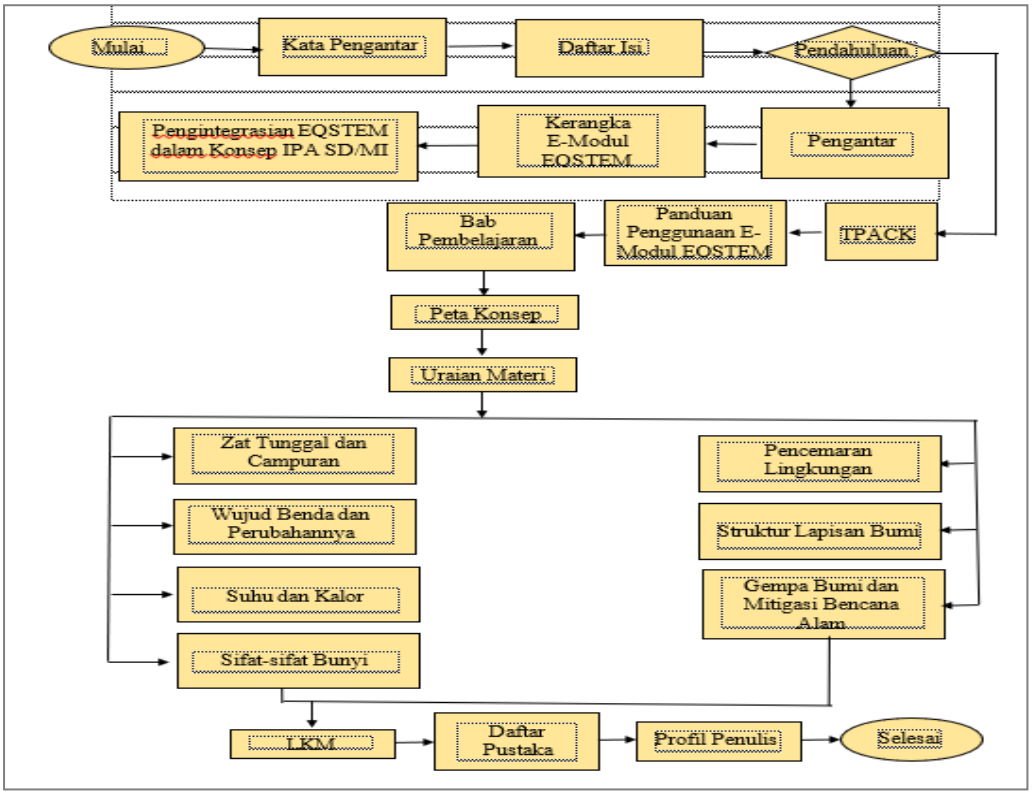


Figure 1: E-module menu flowchart

1.3. Development

The development stage is a product realization stage. Based on the steps outlined in the product planning and design stages, then in the development stage, the Ethno Qur'anic STEM-based e-module was validated by expert lecturers in material, media, and Qur'an interpretation. In the validation process, validators used instruments that had been prepared before. The aim of module validation was to determine the advantages and disadvantages of Ethno Qur'anic STEM-based e-module conceptually by material experts, media experts, and Qur'an interpretation experts practically by practitioners in their fields. Data from the results of the validation test were analyzed using a descriptive percentage and a categorical technique to describe the module's feasibility and practicality for users.

The development product that has been designed produced teaching materials in the form of an Ethno Qur'anic STEM-based e-module consisting of 5 Chapters discussing the concepts of Science. The integration pattern of Ethno Qur'anic STEM in Science learning was also carried out in each sub-chapter in the e-module section. Details of the integration pattern of Ethno Qur'anic STEM in the concept of Science are presented in Figure 2.

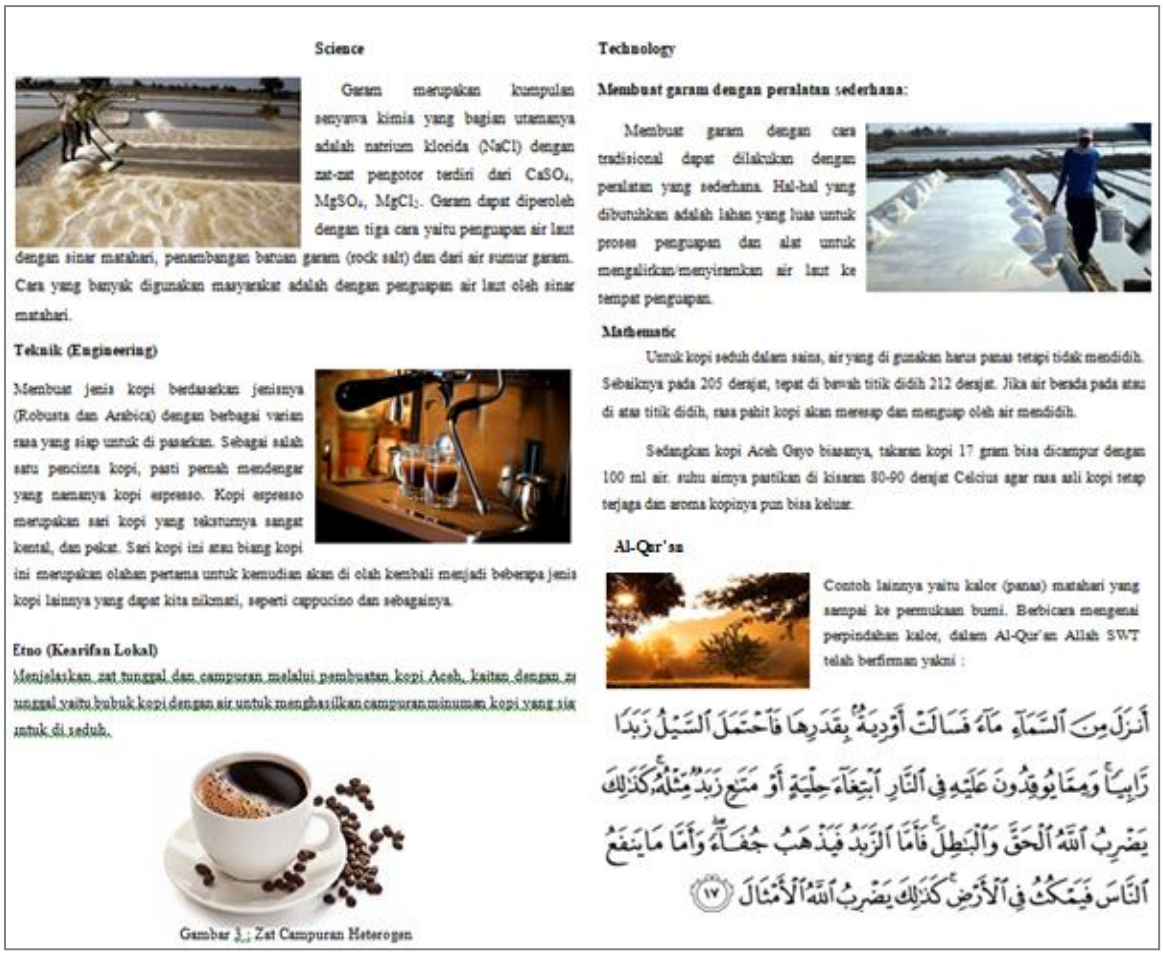


Figure 2: Integration pattern of Ethno Qur'anic STEM in the concept of Science

Based on the description above, the development of an Ethno Qur'anic-STEM-based e-module in the concept of Science is expected to be able to provide comprehensive understanding to students by correlating the creation of natural events with the greatness of Allah SWT. Besides that, the development of an Ethno Qur'anic-STEM-based e-module is expected that all problems hindering teachers in implementing STEM Education and Al-Quran integration can be solutions in improving the knowledge of prospective elementary school teachers and guiding them towards the implementation of STEM with the appreciation of Al-Quran in the teaching and learning process, especially in the concept of Science.

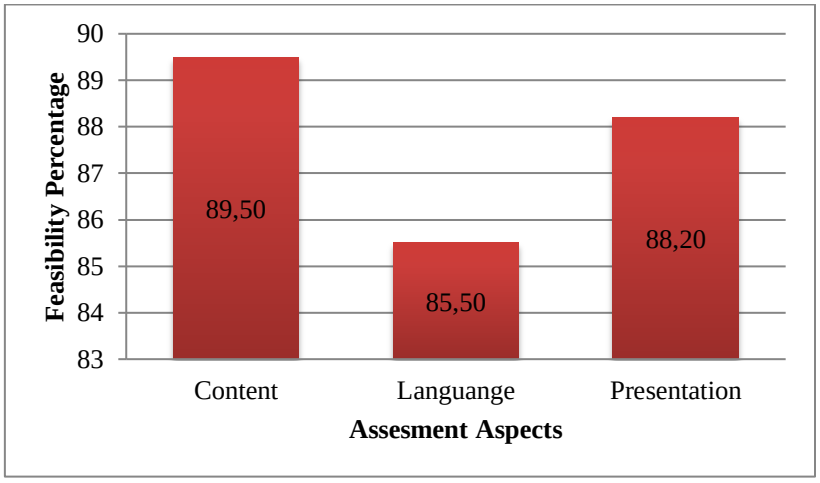
2. Assessment of Ethno Qur'anic-Based E-Module

2.1. Validity Assessment

Validity assessment of the Ethno Qur'anic STEM-based e-module was carried out through the assessment of experts, including material, media, and Al-Qur'an interpretation experts, to assess the quality and feasibility of Ethno Qur'anic STEM-based e-module using Flip PDF Professional software. The expert validators provided an assessment of each question in the validation sheet and provided suggestions as references in revising materials in the e-module being developed. Then, the results of the validation sheet were used as a reference for revising the e-module. Moreover, data analysis was carried out through an alpha test to determine the validation value of the resulting product. E-module products that have been validated can be stated as feasible or ready for practical use testing by prospective elementary school teachers. The following are the results of the validity assessment carried out by validating the e-module product.

a) Material Expert Assessment

This assessment aims to determine the feasibility of an e-module for learning the concept of elementary school Science based on the completeness of the material, the accuracy of the material content, and the language used. This assessment was carried out by 10 material experts and those who teach elementary school Science courses. The results of the assessment validation of the Ethno Qur'anic STEM-based e-module materials in the concept of Science can be seen in Graph 1.



Graph 1. The average results of assessment validation of e-module materials

Based on the data from the results of the material expert assessment in Graph 1, it can be seen that the Ethno Qur'anic STEM-based Science e-module overall received an average score of 87.80% and met the very feasible criteria to be used in learning the concepts of elementary school Science. However, based on the graph, the language assessment aspect showed a lower percentage than the two other aspects, which showed that language and local wisdom have a very close relationship, so there are still differences in language as a means of expressing, conveying, and preserving local wisdom. This is in line with the previous study that the validity results of the development of teaching materials with the Ethno-STEM approach met the validation standard in the very good category. [24] Furthermore, Sudarmin revealed that Ethno-STEM is really suitable for Indonesia because it has various socio-cultural backgrounds, which can improve creativity and innovation in learning. [25] Thus, the development of an Ethno-Quranic STEM-based e-module is really important in helping students think about the concepts learned in life based on the guidelines of the Al-Qur'an.

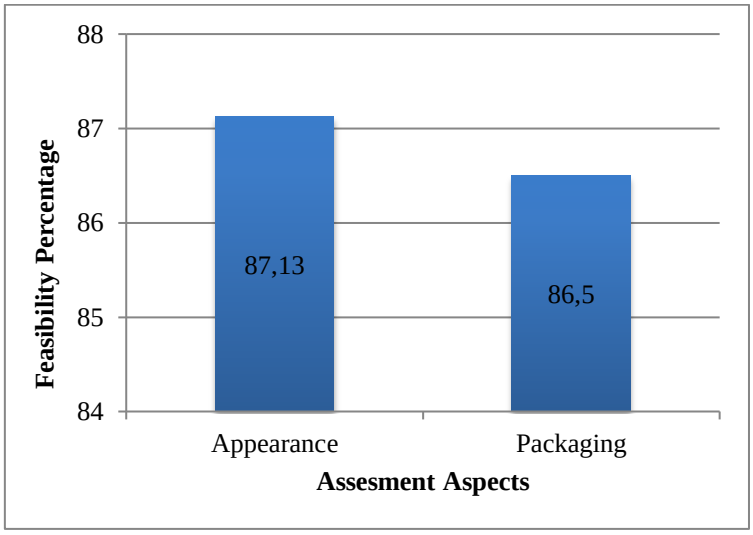
b) Media Expert Assessment

Assessment by media experts aims to determine the feasibility of the Ethno Qur'anic STEM-based e-module reviewed in terms of design in the form of appearance and packaging of the e-module. Media assessment was conducted by 13 media experts who teach elementary school Science courses spread across several Islamic Religious Colleges, including UIN Ar-

[24] Siti Nurul Izzah et al., "Pengembangan Tes Penguasaan Konsep IPA Berpendekatan STEM Terintegrasi Etnosains (Etno- STEM)," *Prosiding Seminar Nasional Pascasarjana Universitas Negeri Semarang*, (2019), 743–47.

[25] Sudarmin et al., "Students' Innovative and Creative Thinking Skill Profile in Designing Chemical Batik after Experiencing Ethnoscience Integrated Science Technology Engineering Mathematic Integrated Ethnoscience (Ethno-Stem) Learnings," in *6th International Conference on Mathematics, Science, and Education (ICMSE 2019)* (Journal of Physics: Conference Series, 2020), 1–7, https://doi.org/10.1088/1742-6596/1567/2/022037.

Raniry, IAIN Langsa, IAIN Lhokseumawe, and IAIN Takengon. The results of the assessment validation of the Ethno Qur'anic STEM-based e-module media in the concept of Science can be seen in Graph 2.



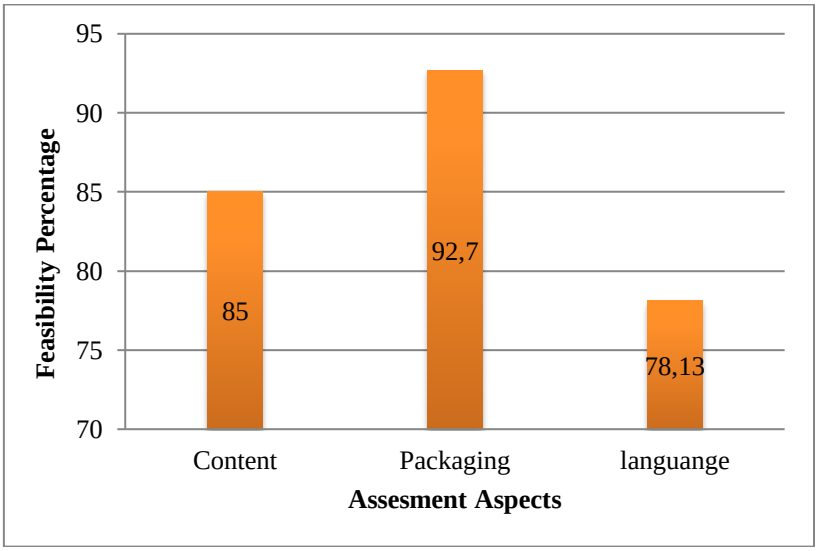
Graph 2. The average results of assessment validation of e-module media

Based on the data from the results of the media expert assessment in Graph 2, it can be found that the Ethno Qur'anic STEM-based Science e-module overall received very feasible criteria to be used in learning the concept of elementary school Science with a score of 87.8%. This finding is in line with the previous study, which revealed that the average percentage of validation in the assessment of the display aspect of the Ethno STEM-based e-module was 94.50% with the "Very Feasible" category.[26]

c) Al-Qur'an Interpretation Expert Assessment

An assessment by an Al-Qur'an interpretation expert aims to determine the feasibility of Al-Qur'an materials and interpretation in the development of a Science e-module. An e-module integrating Al-Quran verses was developed in each topic of the material to make students understand the correlation between everyday phenomena and Al-Qur'an verses. Expert assessment of Al-Quran material and interpretation was carried out by 8 experts consisting of lecturers who are experts in Al-Quran interpretation. The results of the assessment validation of the Ethno Qur'anic STEM-based e-module can be seen in Graph 3.

[26] Rahma Annisa Izzania, Woro Sumarni, and Harjono Harjono, "Pengembangan E-Modul Ajar Kimia Hijau Bermuatan Etno-STEM Berbasis Guided Inquiry Untuk Membekali Kemampuan Berpikir Kritis Peserta Didik," *Jurnal Inovasi Pendidikan Kimia* 18, no. 1 (2024): 7–16, https://doi.org/10.15294/jipk.v18i1.46536.



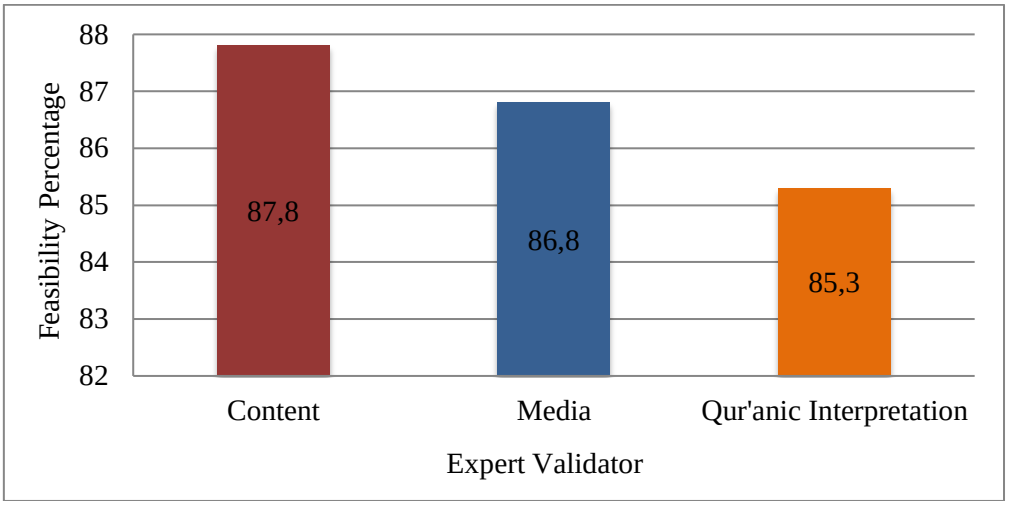
Graph 3. The average results of assessment validation of Al-Quran interpretation

Based on the data from the validation results of the Al-Quran experts in Graph 3, it can be seen that the design of the Ethno Qur'anic STEM-based Science e-module overall received very feasible criteria with a score of 85.3%. Moreover, the graph also shows that the language aspect obtained a lower percentage than the two other aspects. This is the same as that shown in the assessment by material experts in Graph 1. This is influenced by different local wisdom in each region, so the way a language expresses certain concepts is also different. This causes differences in the assessment of language aspects, especially in terms of meaning, use, and interpretation of words or expressions, which are influenced by local cultural context.[27] The average percentage by Al-Qur'an interpretation experts obtained that the Ethno Qur'anic STEM-based E-module has integrated verses and the interpretation of Al-Qur'an correctly. However, there are suggestions for improvement by Al-Qur'an interpretation experts continuing to make improvements in terms of writing Al-Qur'an verses, either from the font type, font size, or uniformity in the placement of verses. In Al-Qur'an, determining the exact basic word, ambiguity in the meaning of words, and differences of opinion regarding how the basic word is used in the context of verse still require more careful interpretation in the Q-STEM approach.[28]

Based on the results of validation from 3 expert validators in assessing e-module development, Graph 4 shows the overall percentage of the feasibility of an Ethno Qur'anic STEM-based E-module.

[27] Benjamin Lee Whorf et al., *Language, Thought, and Reality: Selected Writings of Benjamin Lee Whorf* (The MIT Press, 2012).

[28] G Ranawigena, D Anggrayni, and ..., "Instrumen Quranic STEM Terhadap Perkembangan Dakwah Era Digital: Analisis Rasch Model," *Komunika: Journal* ... 7, no. 2 (2023): 41–51, https://doi.org/10.32832/komunika.v7i2.14434.



Graph 4. The average results of validator validation

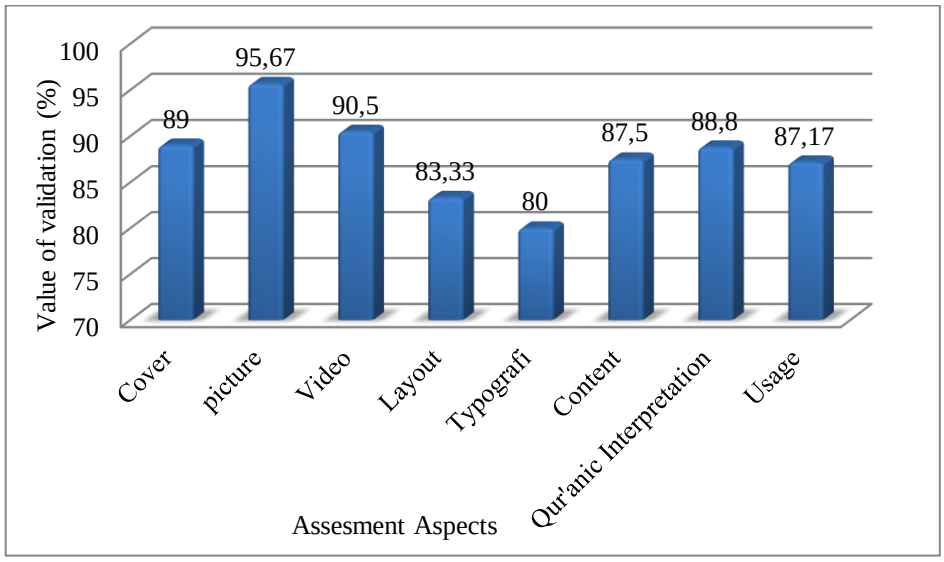
Based on Graph 4, it was found that the Ethno Qur'anic STEM-based e-module that has been developed obtained an average percentage of 86.63% with very feasible criteria to be used in learning the concept of Science. The results of the graph also show that in the assessment aspect, the Al-Qur'an interpretation expert validator obtained a lower average percentage than the two aspects of material and media expert validator. This is because there are some difficulties in determining the exact basic words, ambiguity in the meaning of words, and differences of opinions regarding how basic words are used in the context of verses. Therefore, the development of the Ethno-STEM e-module still requires more careful interpretation when integrating with Al-Qur'an. Based on the Al-Quran, scientific and religious knowledge are closely related because both come from the same source, which is knowledge from Allah SWT. This finding is in line with the previous study, which revealed that some teachers do not know the appropriate verses in Al-Qur'an correlated with the concept of science due to a lack of knowledge in interpreting Al-Qur'an. Therefore, there are still few studies that examine the Ethno Qur'anic STEM approach, but several other studies that are only limited to Ethno-STEM have succeeded in developing Ethno-STEM-based E-module in the material of integral rotating object volume and have been validated by validators of meeting the feasibility criteria. [29]

2.2. Practicality Assessment

Practicality assessment is to obtain direct feedback from users regarding the quality of the e-module being developed. The design of the practicality assessment was carried out by beta test based on the data obtained from 20 students of prospective elementary school teachers

[29] Novita Rahma Sari, Akhmad Nayazik, and Arie Wahyuni, "Pengembangan E-Modul Berbasis Ethno-STEM Pada Materi Volume Benda Putar Integral," *JNPM (Jurnal Nasional Pendidikan Matematika)* 6, no. 3 (2022): 565, https://doi.org/10.33603/jnpm.v6i3.7289.

who participated in learning the concept of Science in the 2022/2023 academic year as the subject of the study. In this assessment, students provide an assessment based on the statement items in the practicality questionnaire given via Google Forms. Data from the validation results of the beta test assessment on the practicality of the Ethno Qur'anic STEM-based e-module are presented in Graph 5.



Graph 5. The results of the Beta Test validation

The results of beta test validation in Graph 5 show that the highest percentage is obtained in the aspect of image and video selection. This reveals that using images and video in the Ethno Qur'anic STEM-based e-module really helps teachers deliver the concept of Science to students in supporting 21st-century learning. This is in line with the previous study, which revealed that in the image aspect in the I-STEM-based Science module, the overall percentage of lecturer formative assessment was 90.60% and strongly agreed with the use of images in the e-module.[30]

The results of Graph 5 also show that the typography aspect obtains the lowest validation percentage, which shows that typography and Acehnese cultural wisdom have a close correlation in the context of how local culture is expressed and preserved through the visualization of letters and designs. However, the fact in the context of Acehnese culture, there are several differences of perspective regarding how to communicate traditional and religious values through the selection of fonts and layouts that reflect politeness, beauty, and spirituality valued in Acehnese society. However, based on the results of the overall validation percentage,

[30] Misbahul Jannah, Wati Oviana, and Iin Nurhalizha, "Pengembangan Modul IPA Berbasis Islamic Science Technology Engineering and Mathematics Pada Materi Hukum Newton" 13, no. 1 (2021): 83–94.

the assessment of prospective elementary school teachers regarding the practicality of the e-module obtained an average score of 88.87% with a very practical criterion. Therefore, Ethno Qur'anic STEM-based e-module can be used to learn the concept of Science in elementary school. This is supported by the study by Ramli, which discussed that the development of the learning module using STEM and appreciation for the Qur'an is successful and effective to be used.[31] Furthermore, a study by Sandria revealed that an Ethno STEM-based E-module for Serunai Musical Instrument assisted by Andromo was produced, which was very valid, practical, and effective.[32] Therefore, the results of the practicality assessment for the development of E-module integration STEM with the Qur'an encourage technological development and innovation that is useful for humanity without violating Islamic principles. Basically, the customs and culture of the Acehnese people are based on Islamic teachings and are an inseparable aspect of life in the Acehnese people's lives.

C. Conclusion

Based on the results of validation assessment from validators, it can be concluded that the development of the Ethno Qur'anic STEM-based Science e-module designed using the Alessi and Trollip instructional model has met feasible and very practical criteria to be used by prospective teachers in understanding the concept of Science to improve the quality of skills on prospective elementary school teachers who support 21st-century learning. The development of the Ethno Qur'anic STEM-based e-module in the concept of Science has reached the development stage. Therefore, this development can be continued to the field trial stage to determine the effectiveness and practicality of the product before being used as learning materials in the implementation of the Science learning process at primary school. It is expected that the use of an Ethno Qur'anic STEM-based e-module is able to form generations that are not only intellectually intelligent and technically skilled but also have strong moral and spiritual foundations according to Islamic teachings. Furthermore, the next researchers are expected to conduct research up to the dissemination stage. The researcher's gratitude goes to the Elementary School Teacher Education Program of UIN Ar-Raniry University, Banda Aceh.

[31] Ramli and Ibrahim, "Q-STEM Module Promotes Al-Quran Appreciation in Teaching STEM." *Proceedings - 2017 7th World Engineering Education Forum, WEEF 2017- In Conjunction with: 7th Regional Conference on Engineering Education and Research in Higher Education 2017, RCEE and RHEd 2017, 1st International STEAM Education Conference, STEAMEC 201*. (2018), 623-627.

[32] Ferry Sandria, Prima Aswirna, and Allan Asrar, "Development Of E-Module " Etnostem " With Andromo-Assisted Serunai Musical Instrument Towards Students ' Creative Thinking Ability," *Proceedings 4rd UIN Imam Bonjol International Conference on Islamic Education*. (2023), 540–53.

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