Eligibility Test for Science, Technology, Engineering, Arts, Mathematics (STEAM) Based Syntax Modules

Reni Kusmiarti[1](✉), Johanes Sapri[2], Ria Ariesta[2], and Dian Eka Candra Wardana[2]

[1] Faculty of Teacher Training and Education, University of Muhammadiyah Bengkulu, Bengkulu, Indonesia
renikusmiarti@umb.ac.id

[2] Faculty of Teacher Training and Education, University of Bengkulu, Bengkulu, Indonesia

Abstract. In the era of society 5.0, an integrated learning approach is needed to improve student understanding, especially in the Syntax Course. An integrated approach based on Science, Technology, Engineering, Art, Mathematics (STEAM) can be applied to modules as student learning materials. The feasibility of STEAM-based modules is needed to ensure that the STEAM approach can be applied properly so that it can support the student learning process. This study aims to describe the feasibility of STEAM-based syntax modules as teaching materials for students of the Indonesian Language and Literature Education Study Program. This type of research is development research. The module feasibility test process was carried out twice including material expert validation, linguistic expert validation, and graphic/media expert validation. In the feasibility test of this module, a Likert scale is used with four assessment criteria, namely very unfeasible, quite feasible, feasible and very feasible. The results of the phase 1 feasibility test indicate that the STEAM-based syntax module is feasible to use with revisions, with the average results of material expert validation being 3.11, linguist validation 3.23 and graphic/media expert validation being 3.20. Furthermore, improvements were made with the results of the feasibility test phase 2 which showed that the STEAM-based syntax module was very feasible to be used as a support for the learning process with the average results of material expert validation being 3.72, linguistic expert validation 3.71 and graphic/media validation being 3.68. Based on the assessment of the three expert validations, the STEAM-based syntax module is very feasible to be one of the teaching materials that can support the learning process in the Indonesian Language and Literature Education Study Program.

Keywords: Eligibility Test · Module · Syntax · STEAM

1 Introduction

One of the important factors and affects the effectiveness of a learning is the existence of teaching materials. Teaching materials are absolutely needed in learning. Teaching materials are components of content in the curriculum that must be delivered to students,

W. Yunita and M. Fadhli (Eds.): ICETeP 2021, ASSEHR 680, pp. 221–229, 2023.
https://doi.org/10.2991/978-2-494069-19-0_23

namely a set of material or substance of lessons that are arranged in a coherent and systematic manner that describes the competencies that will be mastered by students in the learning process. Teaching materials are also learning substances that are arranged systematically from the competencies that will be mastered by students in the learning process. Rahmayanti et al. argue that teaching materials are all forms of materials used to assist teachers in carrying out teaching and learning activities that contain curriculum content that is systematically arranged both written and unwritten and must be understood by students in an effort to achieve curriculum goals [1]. Teaching materials are designed and adapted to learning rules, adapted to teaching materials, arranged based on learning needs, there is an evaluation, and interesting teaching materials for students to learn. According to Arsanti, teaching materials can be in the form of written materials such as handouts, books, modules, worksheets, brochures, leaflets, wallcharts, as well as unwritten materials such as videos/films, VCDs, radio, cassettes, computer-based interactive CDs and the internet [2].

The module is one of the teaching materials that helps students understand a particular subject and obtain information about learning materials independently. Erawanto said that the module is one of the print media that contains learning units, equipped with various components (introduction, content and ending) to achieve learning goals independently or with as little help as possible from lecturers, and can evaluate their own abilities [3]. The module consists of several components. The module has parts that must be developed to form a good and standardized module. According to Solikhah, the module components consist of a review of subjects, learning activities, exercises, signs for answer exercises, summaries, formative tests, and answer keys for formative tests, follow-up [4].

Explanation of the Directorate of Education Personnel of the Directorate General of PMPTK that the steps for compiling the module include analysis of module requirements, drafting, testing of module drafts, validation, revision [5]. Validation is the process of requesting approval or validation of the suitability of the module with the needs so that the module is feasible and suitable for use in learning. The acknowledgment of conformity is carried out by involving practitioners who are experts in the relevant fields in the module. The module eligibility standards according to the National Education Standards Agency include content eligibility, language eligibility, presentation eligibility and graphics eligibility [6].

The STEAM-based syntax module is a module that formulates Science, Technology, Engineering, Arts, Mathematics (STEAM) in learning situations as a unit. STEAM according to Rahim is an approach that encourages curiosity, asks basic questions, and stimulates creativity in problem solving. Collaboration and emphasis on process-based learning is at the heart of the STEAM approach [7]. Ozkan and Topsakal said that STEAM in science, mathematics, engineering, arts and technology is taught by integrating these fields holistically and helping to actualize student learning in terms of concepts, principles, and actions related to science classes [8]. Kusmiarti et al. also said that STEAM is a learning approach that can encourage students to think more broadly about problems in the real world and support learning experiences for problem solving [9]. The integration of STEAM in the syntax module on the science aspect refers to a collection of various scientific concepts, knowledge gained through learning and proof through scientific

methods. Technology is the use of technology in learning that facilitates the learning process and can accelerate the process of knowledge transfer. Engineering design, focuses on the engineering process obtained through learning, experience, and applied to practice when providing learning materials. Aesthetic arts or the value of beauty includes creativity, beauty, and attractiveness. Mathematics is a thought process related to logic, reasoning, logical and systematic thinking.

Daryanto stated that a module can be said to be good and attractive if it has 5 characteristics, namely self-instruction, self-contained, stand-alone, adaptive, and user friendly [10]. Rahdiyanta said the same thing [11]. This STEAM-based syntax module is a prototype design from the author's initial product development which still requires expert validation to determine the feasibility, accuracy, and accuracy of the initial product developed. Based on this, the authors want to validate and test the feasibility of a syntax module based on Science, Technology, Engineering, Arts, Mathematics (STEAM) based on the feasibility of the material, the feasibility of language, and the feasibility of graphics. The purpose of this test is to produce a syntax module based on Science, Technology, Engineering, Arts, Mathematics (STEAM) that meets the characteristics of a good and interesting module and is suitable for use in the learning process.

2 Method

This research was conducted using a qualitative descriptive method, the aim is to describe the feasibility of the STEAM-based Syntax module. The research subject is the STEAM-based Syntax module. The data collection technique used a closed questionnaire/questionnaire with a Likert scale of 4 assessment criteria. Score 1 = not feasible (if the feasibility of the module with the statement in the questionnaire is not good); score 2 = quite feasible (if the feasibility of the module with the statement in the questionnaire is quite good); score 3 = feasible (if the feasibility of the module with the statement in the questionnaire is good); score 4 = very feasible (if the feasibility of the module with statements in the questionnaire is very good).

The feasibility test was validated twice by material experts, linguists, and graphic/media experts. The feasibility test of the STEAM-based syntax module material was tested by two lecturers of the Indonesian Language and Literature Study Program, the language feasibility test was tested by three lecturers of the Indonesian Language and Literature Study Program, the graphic feasibility test was tested by one lecturer of the Indonesian Language and Literature Study Program and one a lecturer in the educational technology study program. The data obtained from the data collection instrument were analyzed using percentage analysis adapted from Cut Awwali et al. [12].

$$\mathrm{P} = \frac{\sum R}{N} \times 100\%$$

Notes:
P: Percentage of score sought
$\sum$ *R: The number of answers given by the validator*
N: Total maximum or ideal score

Table 1. Feasibility Test Assessment Criteria

Score	Criteria	Description
81,25 < x ≤ 100	very worthy	If all the items on the elements assessed are very appropriate and there are no shortages with teaching materials so that they can be used as student teaching materials
62,50 < x ≤ 81,25	worthy	If all the items assessed are appropriate, even though there are some shortcomings and need to be justified with the product of teaching materials, they can still be used as student teaching materials.
43,75 < x ≤ 62, 50	quite decent	If all the items in the elements that are judged to be less appropriate, there are a few shortcomings and or a lot with this product, so it needs justification so that it can be used as teaching material.
25.00 < x ≤ 43,75	not feasible	If each item in the element is judged to be inappropriate and there are deficiencies in this product, it is necessary to justify it so that it can be used as teaching material

The results of the calculations obtained from quantitative data, processed and interpreted and concluded qualitatively. To be able to give meaning and make decisions, an assessment category was used which was adapted from the cut of Awwali et al. [12] as in Table 1.

3 Finding and Discussion

The module feasibility test is validated by material experts, linguists and graphic experts. Feasibility tests were carried out twice by material experts, linguists, and graphic experts to determine the improvement in product development carried out and to determine the feasibility of the product before and after being revised based on comments and suggestions given by experts. The results of the expert feasibility test are as follows:

3.1 Material Expert Feasibility Test Assessment Result

The material expert feasibility test assessment was validated by two lecturers of the Indonesian Language and Literature Study Program, namely Dr. Agus Trianto, M.Pd. and Prof. Dr. Arono, M.Pd. Validation is done twice. The results of the assessment and validation of material experts in this first stage on the aspect of content feasibility are an average of 3.15; the average presentation feasibility is 3.06; and the feasibility of STEAM activities on average 3.10. Overall, the validation of this first stage with an average of 3, 11 or 77.75 criteria is feasible with revisions. The revisions from the two material experts can be seen in Table 2.

After revising the material expert's suggestions on teaching materials/syntax modules based on the STEAM approach, a second feasibility test was conducted with the

Table 2. Material Expert Validator Suggestion

Number	Suggestion
1	The module display format should not be like the Open University(UT) module. At least the format follows the scientific syntax. From the data to the conclusion
2	Art can also be selected from works of art (short stories or novel quotes) for variety.
3	A good module of course has assignments and exercises that serve to help understand the material and use understanding for analysis (linguistics) or some form of formative test
4	Learning modules do not have to be in the form of a book but can be 1–3 modules that reflect the model
5	It would be better if there was a glossary
6	Snippets of literary works can also be used as text for analysis. This at the same time characterizes STEAM engineering, engineering, sentence engineering and its elements to express certain goals
7	Each module or teaching material must have a theoretical basis, in this case STEAM. The complete module consists of pre-learning, core learning (STEAM-based), and learning evaluation

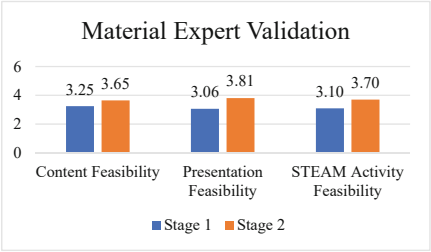

Fig. 1. Material expert validation results

same material expert. The aspect of the feasibility of the average content of 3.65; the average presentation feasibility is 3.81; and the feasibility of STEAM activities on average 3.70. Overall, this second stage of validation with an average of 3, 72 or 93.00 criteria is very feasible. The validation results are listed in the Fig. 1.

3.2 Linguistics Eligibility Test Assessment Results

The assessment of the linguistics qualification test was carried out twice by three lecturers of the Indonesian Language and Literature Study Program, namely Prof. Dr. Syanurdin, M.Pd., Dr. Agus Trianto, M.Pd. and Prof. Arono, M.Pd. The results of the validation of linguists include aspects of the suitability of language use with the level of student development 3.7; communicative 3.33; dialogical and interactive 2.83; use of terms, symbols or icons. 3.00; straightforward 3.00; conformity with Indonesian language rules 3.67. Overall, the validation of this first stage with an average of 3.23 or 80.75 criteria is

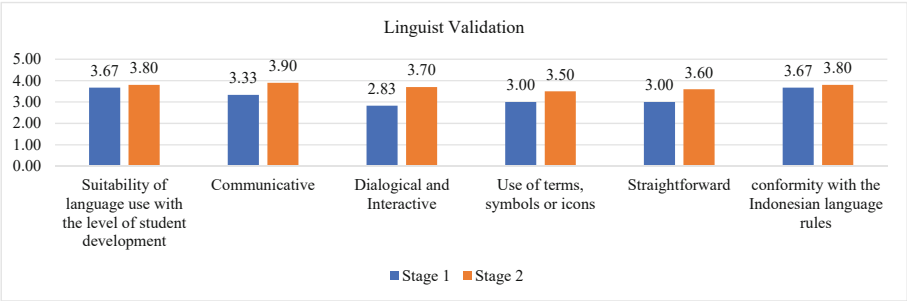

Fig. 2. Linguist validation results

Table 3 .

Number	Suggestion
1	The use of punctuation and capital letters is adjusted to the rules
2	The effectiveness of the use of sentences in paragraphs, the use of exclamations or commands is reviewed
3	Writing reference sources reviewed
4	The use of language has shown adherence to linguistic rules, however, it is also necessary to use sentence variations so that it does not seem monotonous in each chapter.
5	writing of reference sources should be consistent
6	Accurate use of language to motivate students

appropriate/good with revisions. The revisions of the three material experts can be seen in the Table 3.

After revising the suggestions of linguists on teaching materials/syntax modules based on the STEAM approach, a second assessment and validation was carried out with the same linguist. The results of the second stage of linguistics assessment and validation include aspects of the suitability of language use with a student's development level of 3.80; communicative 3.93; dialogical and interactive 3,7; use of terms, symbols or icons. 3.50; straightforward 3.60; conformity with the Indonesian language rules 3.80. Overall, this second stage of validation with an average of 3.71 or 92.75 criteria is very feasible/very good. The validation results are listed in the Fig. 2.

3.3 The Result of Feasibility Test of the Graphic Expert

The assessment was carried out by a graphic/media expert and was validated by two lecturers, namely Prof. Dr. Bambang Sahono, M.Pd lecturer in Educational Technology and Prof. Dr. Syanurdin, M.Pd. Indonesian Language and Literature Study Program. Validation is done twice. The results of the assessment and validation of the graphic/media

Table 4. Suggestions for graphic/media expert validators

Number	Suggestions
1	The use of illustrations should make it easy to understand and create interest.
2	The placement and appearance of layout elements (chapters, sub-chapters, and page numbers) must be precise and easy to understand
3	The placement of layout elements must be consistent based on a certain pattern
4	The use of font size for the title of the material must be more dominant and proportional compared to the size and name of the author
5	The use of color layout elements must be attractive, harmonious and clarify the function
6	The choice of the title color of the material must be right and contrast with the background color

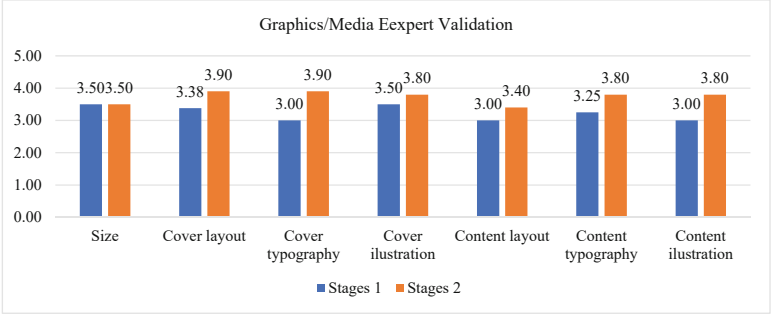

Fig. 3. Graphic/media validation results

expert in the first stage include aspects of size 3.50; 3.38 cover layout; cover typography 3.00; closing illustration 3.50; 3.00 content layout; 3.25 content typography; and illustration content 3.00. The results of the evaluation and validation of graphic/media experts in this first stage overall with an average of 3, 20 or 80.00 Criteria are eligible for revision. The second revision of the graphic/media expert is attached in Table 4.

After revising the advice of graphic/media experts on teaching materials/syntax modules based on the STEAM approach, a second validation was carried out with the same expert. The results of the second stage of evaluation and validation of graphic/media experts include aspects of size 3.50; 3.90 cover layout; cover typography 3.90; cover illustration 3.80; 3.40 content layout; 3.80 content typography; and content illustration 3.80. Overall, this second stage of validation has an average of 3.68 or 92 with very decent/very good criteria. Validation results in the Fig. 3.

The results of the material expert feasibility test which include aspects of content feasibility, presentation feasibility, first stage STEAM approach activities are an average of 3, 11 or 77.75 eligible criteria with revisions. Second feasibility test with the same material expert. The aspect of the feasibility of the average content of 3.65; the average

presentation feasibility is 3.81; and the feasibility of STEAM activity on average 3.70. Overall, this second stage of validation with an average of 3, 72 or 93.00 criteria is very feasible.

The feasibility test of linguists includes aspects of conformity to the level of development of students, communicative, dialogical and interactive, coherence and integration of the flow of thought. Overall, the first phase of the feasibility test – an average of 3.23 or 80.75 criteria for proper/good with revisions. The overall second-stage linguistics feasibility test averaged 3.71 or 92.75 very decent/very good criteria.

The feasibility test for graphic/media experts includes aspects of size, cover layout, cover typography, cover illustrations, content layout, content typography and content illustrations. in this first stage overall with an average of 3, 20 or 80.00 criteria eligible for revision. Overall, the second feasibility test averaged 3.68 or 92 with very decent/very good criteria. This very feasible criterion reveals that the layout, typography of the module illustrations are interesting, can motivate students in learning, and have described the content of the message to be conveyed in learning. This is in accordance with Dalyanto's opinion that the attractiveness of the module can be developed in several parts of the front cover, by combining colors, images (illustrations), matching letter shapes and sizes, the content of the module by placing stimuli in the form of images or illustrations, printing bold, italic, underline or color [10]. A good and interesting module makes it easier for students to learn and does not depend on the tutor. Students can learn according to their respective abilities and learning speed, so that the learning process can be carried out completely.

4 Conclusion

Based on the results of the feasibility test, it can be concluded that the syntax module based on Science, Technology, Engineering, Arts, Mathematics (STEAM) from two tests by material experts, linguists and graphic experts was declared very feasible. Very feasible criteria indicate that the syntax module is very suitable for use in learning and can be used by students as a supporter in the learning process.

Acknowledgments. The researcher thanks the promoter Prof. Dr. Johanes Sapri, M.Pd. Co-promoter Dr. Ria Ariesta, M.Pd., and Dr. Dian Eka Candra Wardana, M.Pd. Thanks also to all validators, both material expert validators, linguists and graphic experts, namely Prof. Dr. Bambang Sahono, M.Pd., Prof.Dr. Syanurdin, M.Pd, Prof. Dr. Arono, M.Pd., Dr. Agus Trianto, M.Pd. who has validated and reviewed the syntax module based on Science, Technology, Engineering, Arts, Mathematics (STEAM), so that it is very suitable for use in learning.

Authors' Contributions. The author's contribution to this research, Reni Kusmiarti designed a draft module, formulated a feasibility test design for a STEAM-based module, collected data, analyzed data, concluded the results of the analysis, and wrote draft articles. Meanwhile, Johanes Sapri, Ria Ariesta, Dian Eka Candra Wardana checked the data analysis and reviewed the manuscript. Finally, all authors read and agreed to the final version of the manuscript.

References

1. Rahmayanti, M., Kusdiana, A., & Nugraha, A. (2018). Pengembangan Bahan Ajar Pembelajaran Menulis Berbasis Kearifan Lokal Melalui Permainan Bahasa di Sekolah Dasar. *PEDADIDAKTIKA Jurnal Ilm Pendidikan Guru Sekolah Dasar, 5*(3), 12.
2. Arsanti, M. (2018). Pengembangan Bahan Ajar Mata Kuliah Penulisan Kreatif Bermuatan Nilai-Nilai Pendidikan Karakter Religius bagi Mahasiswa Prodi PBSI, FKIP, UNISSULA. *KREDO Jurnal Ilmu Bahasa dan Sastra, 1*(2), 69–88.
3. Erawanto, U. (2016). Pengembangan modul pembelajaran berbasis masalah untuk membantu meningkatkan berfikir kreatif mahasiswa. *JINoP Jurnal Inovasi Pembelajaran, 2*(2), 427–436.
4. Solikhah, I. (2016). *Pedoman Lengkap Pengembangan Buku Teks dan Bahan Ajar untuk Perguruan Tinggi.* Pusat Kajian Bahasa dan Budaya Center of Language and Culture Studies.
5. Direktorat Tenaga Kependidikan Ditjen PMPTK. (2008). *Penulisan Modul*. Ditjen PMPTK.
6. Badan Standar Nasional Pendidikan. (2014). *Bahan Sosialisasi: Standar Penilaian Buku Teks Pelajaran.* Jakarta.
7. Rahim, F. (2019). *How to STEAM your classroom, REVO 4.0 model-outside The Box (part 1).* AGTIFINDO.
8. Özkan, G., & Umdu Topsakal, Ü. (2020). *A STEAM activity that can be used in science education.*
9. Kusmiarti, R., Sapri, J., & Ariesta, R. (2021). The need for the development of indonesian language syntax teaching materials based on STEAM approach. *International Conference on Educational Sciences and Teacher Profession (ICETeP 2020)* (pp. 385–390).
10. Daryanto. (2013). *Menyusun Modul Bahan Ajar untuk Persiapan Guru dalam Mengajar.* PT. Gava Media.
11. Rahdiyanta, D. (2016). Teknik Penyusunan Modul. *Artik. Httpstaff Uny Ac Idsitesdefaultfilespenelitiandr-Dwi-Rahdiyanta-Mpd20-Tek.-Penyusunan-Modul Pdf Diakses* (vol. 10).
12. Rahmatina, C. A., Jannah, M., & Annisa, F. (2020). Pengembangan Bahan Ajar Berbasis Science, Technology, and Mathematics (STEM) di SMA/MA. *Jurnal Pendidikan Fisika dan Teknologi*, *1*(1), 27–33.