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Development of FOCUSKY Learning Media with STEM (Science, Technology, Engineering, and Mathematics) Approach Based on Project-Based Learning for 4th Grade Elementary School Students

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Abstract. *This study aims: 1) to determine the steps of developing Focusky media; 2) to determine the quality of Focusky learning media used in the learning process for the material of theme 8 'My Area' subtheme 2 'Uniqueness of My Area' lesson 2 using a STEM-based project-based learning approach for 4th-grade elementary school students. This study is a Research and Development (R&D) study. The development model employed in this study is the ADDIE development model (Analysis, Design, Development, Implementation, Evaluation). The subjects in this study are media expert validation subjects, subject matter experts, and learning experts. Data analysis techniques involve both quantitative and qualitative data. The research results of the media quality test indicate that the media expert assessment obtained a score of 77.94 in the 'excellent' category. The subject matter expert assessment received a score of 78.57 in the 'excellent' category. The learning expert assessment received a score of 95.45 in the 'excellent' category. The teacher assessment obtained a score of 90.38 in the 'excellent' category. The cumulative result of product quality based on expert evaluations and teacher responses yielded an average of 87.18 in the 'excellent' category. Based on the assessment results of the quality test, it can be concluded that the Focusky learning media used in the learning process for the material of theme 8 'My Area' subtheme 2 'Uniqueness of My Area' lesson 2, with a STEM-based project-based learning approach for 4th-grade elementary school students, has been developed excellently and is suitable for instructional use.*

Keywords: *Focusky Learning Media, STEM, Project-Based Learning*

1. INTRODUCTION

Education is a universal and continuous process that spans from generation to generation, playing a crucial role in the development of the nation and this country through the quality of human resources that can continue to advance in both the fields of science and technology (Paju, 2011). The low quality of human resources is influenced by the quality of education, which is still relatively low in Indonesia. This is supported by the 2018 Programme for International Student Assessment (PISA) research, which ranked Indonesia with scores of 371 in reading, 379 in mathematics, and 396 in science. Indonesia has now entered the 21st century, which has transformed the learning paradigm with the implementation of the 2013 curriculum. This curriculum change necessitates that the concept of learning be formulated in such a way that it can provide more creative education, enabling students to acquire collaborative, teamwork, creative, and critical thinking abilities (Noermanzah & Friantary, 2019).

Various changes in competencies, learning activities, approaches, strategies, teaching methods, and utilized media should be mastered by both teachers and students. Effective learning models recommended to support 21st-century education include inquiry-based learning, design-based learning, project-based learning, and problem-based learning (Lombardi, 2017) (Amini, 2015).

In this study, the model employed is a process-based learning model centered around project-based learning. Learning based on project-based learning has the advantage of making students more active in the learning process. It emphasizes the necessity of positive interaction between teachers and students, ensuring an enjoyable and non-monotonous learning experience while fostering student responsibility (Amirudin, 2015) (Mulyono, 2016).

The project-based learning model provides students the freedom to enhance their motivation to learn and encourages them to engage in significant tasks. This model makes students more active in solving complex problems by improving their information retrieval skills. It offers students the opportunity to develop in accordance with real-world conditions through activities such as discussions, experiments, and project work. This enables them to produce tangible products that can be presented to others, thereby fostering greater engagement in classroom learning activities (Widani, 2019) (Kemendikbud, 2014) (Sulistyowati, 2011).

Research conducted by Wrigley (1998), Curtis (2005), and the National Training Laboratory (2006) has found that the project-based learning model is quite useful in designing effective learning experiences, making it quite promising in meeting the demands of equipping students with skills based on real-life experiences (Sastrika, 2013) (Listiani, 2018) (Yulia, 2016).

This media is an instructional tool that utilizes computer applications. Instructional media essentially consists of 'software' that encompasses messages or information presented using supporting equipment ('hardware') to enable students to receive said messages or information (Muhson, 2010). The application employed is Focusky, which falls under the category of interactive multimedia applications. In the current educational landscape in Indonesia, teachers are expected to equip students with the ability to leverage technology as an educational tool (Najmul, 2017).

The integration of technology in the learning process can be achieved by employing a teaching approach that aids educators in fostering expertise, known as the STEM (Science, Technology, Engineering, and Mathematics) approach. The STEM approach is well-suited for the 2013 curriculum to develop 21st-century skills (Sulistia, 2019) (Nurlenasari, 2019). This approach refers to the four components of science, technology, engineering, and mathematics (Gustiani, 2017) (Syukri, 2013) (Lidinillah, 2019). STEM provides teachers the opportunity to demonstrate to students the concepts, principles, and techniques of science, technology, engineering, and mathematics, all integrated into the development of products, processes, and systems relevant to their daily lives (Suji A, et al., 2019) (Farid, 2013). The STEM approach can be considered a part of learning implementation due to its integrative nature. Integrating the STEM approach into teaching methods can enhance teachers' creativity in delivering instructional content to students (Erviana, 2019) (Becker, 2011).

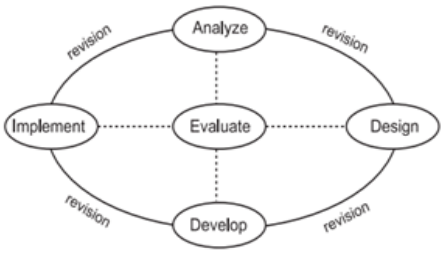
The STEM approach is implemented in thematic learning, which integrates different subjects and connects them to real-life situations, such as in the material for 4th-grade elementary school students in theme 8 'My Area,' subtheme 2 'Uniqueness of My Area' in lesson 2. This is done using the Focusky learning media.

Relevant research conducted by Irma (2019) indicates that the development of Focusky media has met the feasibility criteria. The expert assessment results include a material expert assessment with a development feasibility rating of 84%, categorized as 'highly valid'; a language expert assessment with a validity rating of 77%, categorized as 'valid'; a media expert assessment with a validity rating of 93%, categorized as 'highly valid'; and respondent assessment results with a validity rating of 94.21%, categorized as 'highly valid.'

Based on on-site observations and relevant studies, the author will proceed to develop Focusky media as an instructional tool using the STEM approach based on Project-Based Learning for 4th-grade elementary school students in theme 8 'My Area,' subtheme 2, lesson 2.

2. METHOD

This research falls under the Research and Development (R&D) category. The development model employed in this study is the ADDIE model, developed by Robert Maribe Branch, as outlined in (Sugiyono, 2017: 38). The ADDIE model consists of five development stages: Analysis, Design, Development, Implementation, and Evaluation. However, in this study, due to the COVID-19 pandemic, the research is limited to the development phase, and the student response aspect will be addressed in future research. Below is the ADDIE development model diagram:



Picture 1. ADDIE Research and Development Model

The types of data used in this research are quantitative and qualitative data. Data were obtained from expert assessments (media expert, subject matter expert, learning expert) and teacher responses. Data collection instruments employed in the development of the Focusky media included assessment sheets. The testing phase involved validation trial subjects such as media experts, subject matter experts, learning experts, and teachers. Data analysis techniques in this study encompass both quantitative and qualitative data analysis. Quantitative analysis was used to process data in the form of scored assessments provided by media experts, subject matter experts, learning experts, and teacher responses. On the other hand, qualitative data were utilized to process inputs and suggestions from experts and teacher responses.

3. RESULT AND DISCUSSION

3.1. Result

3.1.1 *Quantitative Data Analysis*

A. ***Product Quality Data Analysis***

Quantitative data analysis was conducted to process the assessment sheet results from media experts, subject matter experts, learning experts, and teachers. The quantitative data results of the Focusky learning media with the STEM-based project-based learning approach, evaluated by media experts, subject matter experts, learning experts, and teachers during the product quality trial, were analyzed for average scores using the formula as described by (Suharsimi, 2013).

$$X = \frac{\sum x}{\mathrm{N}}$$

Information:

X = *average value*
$\sum x$ = *total value*
N = *number of appraisers*

The following is a table of product trial results in the following table:

Table 1. Expert Validation Assessment Results

No	*Expert Assessment*	*Mark*	*Category*
1.	*Media Expert*	*77, 94*	*Very good*
2.	*Materials Expert*	*78,57*	*Very good*
3.	*Learning Expert*	*95,45*	*Very good*
	Summary	***251,96***	***-***
	Average	***83,98***	***Very good***

Based on the data in Table 1 above, it can be observed that the validators' results for the media, subject matter, and learning aspects obtained an average score of 83.98, falling under the 'excellent' category. In addition to the expert validator results, teacher responses received a score of 90.38, also categorized as 'excellent'. The overall assessment of product quality, taking into account evaluations from media experts, subject matter experts, learning experts, and teachers, yielded an accumulated average score. The cumulative result of product quality assessments from the scores provided by media experts, subject matter experts, learning experts, and teacher responses averaged at 87.18, classified as 'excellent'.

3.1.2 ***Results of Qualitative Data Analysis***

A. ***Expert Media Analysis***

Media assessment of Focusky with a STEM-based project-based learning approach by media experts was carried out by a lecturer from the Elementary School Teacher Education (PGSD) program who specializes in educational technology. The results of the media expert's assessment include feedback such as font size, the concept of instructional media which emphasizes teaching before evaluating, font color with background, incorrect dance nomenclature, cover design, and most importantly, the absence of proper referencing for images that are not developer's creations.

B. ***Expert Content Analysis***

The assessment of Focusky media using the STEM-based project-based learning approach by content experts was conducted by a lecturer from the Elementary School Teacher Education (PGSD) program who specializes in elementary science education. The feedback provided by the content expert is that sub-competency indicator 4.3.1 is not evident in the learning activities. It would be better to include activities within the developed product that allow students to measure sub-competency indicator 4.3.1.

C. ***Expert Learning Analysis***

Assessment of focus media with a STEM approach based on project-based learning, according to learning experts, was conducted by a lecturer from the Primary School Teacher Education (PGSD) who is an expert in elementary school teaching. The input provided is that in the scenario or learning activities, the columns are differentiated between the teacher and the students. The learning styles of the students are not always the same, but if this model is tailored to individual students, it is suitable because the acceleration of students' development always varies as each child has their characteristics.

D. ***Teacher Response Analysis***

The assessment provided by teachers doesn't only involve assigning scores. Teachers also provide evaluations in the form of feedback, input, and suggestions with the aim of understanding

the suitability of the product in the learning process. The feedback given by teachers is necessary for improving the content and focus media for the students

3.2. Discussion

3.2.1 *Product Revision*

a. *Improvement Based on Media Expertise Before the revision, there were no author and supervisor names, no STEM and K13 logos, and no university identification. After the revision, on the front page, the STEM and K13 logos were added, along with the author's name, study program, faculty, and university name, and supplemented with images of traditional dances from various regions in Indonesia.*

(1) (2)

Picture 2. Media cover page

Revised information:
Figure (1) cover page before revision
Figure (2) cover page after revision

b. *Fixed the font size of the basic competency section. Before the revision, the basic competency font was not large enough. After revision, the font is larger and more comfortable to read.*

(1) (2)

Picture 3. Basic Competency Page

Revised information:
Picture (1) Basic Competency Display before revision
Picture (2) Basic Competency Display after revision

c. *Improvements to the dance name and image display of the dance material section in Indonesia.*

(1) (2)

Picture 4. Display of the dance material section

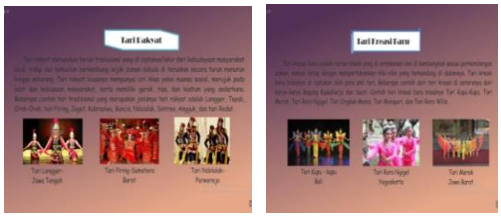
Revised information:
Picture (1) Display of the dance material section before revision
Picture (2) Display of the dance material section after revision

d. *Improved appearance on pure motion materials*

Picture 5. Display of dance movement material

Revised information:
Picture (1) Display of dance movement material before revision
Picture (2) Display of dance movement material after revision

e. Improvement in the presentation of folk dance materials, new creative dance text, and background lacks contrast



Picture 6. Display of dance material

Revised information:
Figures (1 and 2) Appearance of the material for folk dance and new dance creations before revision

Picture 7. Display of dance material

Revised information:
Figures (3 and 4) Appearance of the material for folk dance and new dance creations after revision

f. *Improvements in let's practice dance movements*

Picture 8. Display on let's practice

Revised information:
Figure (1) Display of the let's practice section before the revision
Figure (2) Display of the section for adding dance step material

g. Improvement in the text for reading fiction stories. Before the revision, the font was too small

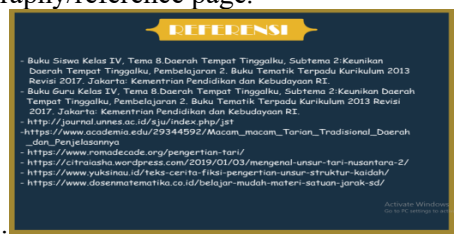
Picture 9. Display of fiction story text

Revised information:
Figure (1) Display of a fictional story section, the font was too small before the revision
Figure (2) Display of the fictional story section, the font is too small after revision

h. *Improvement in Let's Practice Mathematics Counting. Before the revision, there was no explanation material about units of direct distance calculation practice. After the revision, before the counting practice page, additional materials, procedures, step-by-step instructions, and sample questions were added.*

Picture 10. Display of the numeracy material section after revision

i. Addition to the bibliography. Before the revision, there was no bibliography/reference page. After the revision, there is a bibliography/reference page.

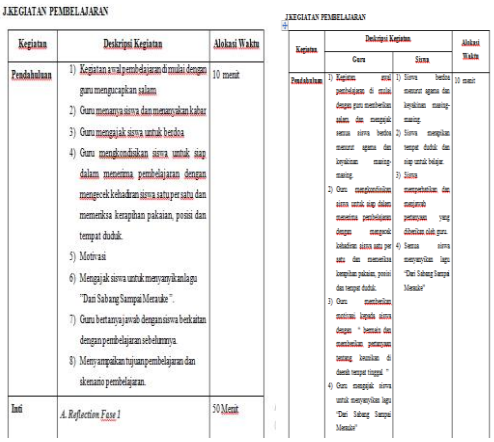


Picture 11. Display of the reference section after revision

j. *Improvement based on Content Expert*
Based on the *content expert validator, there is feedback for the Focusky media regarding the clear measurement of indicator SBdP 4.3.1 in the learning activities. It would be better to add student practical activities for dance movements in the developed product.*

Picture 12. Display on the dance movement practice activity section after revision

k. *Improvement based on Learning Expert*
Based on the learning expert validator, the improvement in the lesson plan (RPP) involves specifying activities for both the teacher and students within the lesson description/scenario. Before the revision, in the scenario section, activities for both the teacher and students were combined. After the revision, activities for the teacher and students are placed in separate columns.



Kegiatan	Deskripsi Kegiatan	Alokasi Waktu
Pendahuluan	1) Kegiatan awal pembelajaran di mulai dengan guru mengucapkan salam 2) Guru menanya siswa dan menanyakan kabar 3) Guru mengajak siswa untuk berdoa 4) Guru mengkondisikan siswa untuk siap dalam menerima pembelajaran dengan mengecek kehadiran siswa satu per satu dan memeriksa kerapihan pakaian, posisi dan tempat duduk. 5) Motivasi 6) Mengajak siswa untuk menyanyikan lagu "Dari Sabang Sampai Merauke". 7) Guru bertanya jawab dengan siswa berkaitan dengan pembelajaran sebelumnya. 8) Menyampaikan tujuan pembelajaran dan skenario pembelajaran.	10 menit
Inti	*A. Reflection Fase 1*	50 Menit

Kegiatan	Deskripsi Kegiatan		Alokasi Waktu
	Guru	Siswa	
Pendahuluan	1) Kegiatan awal pembelajaran di mulai dengan guru membuka salam dan mengajak semua siswa berdoa menurut agama dan keyakinan masing-masing. 2) Guru mengkondisikan siswa untuk siap dalam menerima pembelajaran dengan mengecek kehadiran siswa satu per satu dan memeriksa kerapihan pakaian, posisi dan tempat duduk. 3) Guru memberikan motivasi kepada siswa dengan " bernasi dan memberikan pertanyaan tentang kesiapan di dalam tempat tinggal " 4) Guru mengajak siswa untuk menyanyikan lagu "Dari Sabang Sampai Merauke"	1) Siswa berdoa menurut agama dan keyakinan masing-masing. 2) Siswa menyiapkan tempat duduk dan siap untuk belajar. 3) Siswa memperhatikan dan menjawab pertanyaan yang diberikan oleh guru. 4) Semua siswa menyanyikan lagu "Dari Sabang Sampai Merauke"	10 menit

Picture 13. Learning activities (RPP)

Revised information:
Figure (1) Display of the learning activities section before revision.
Figure (2). Display of the learning activities section after revision.

4. CONCLUSION

Based on the research, it can be concluded that the development of focus media with a STEM approach based on project-based learning was conducted using the steps of the ADDIE model (Analysis, Design, Development, Implementation, Evaluation). However, in this study, the focus was limited to the development phase to assess the quality of the product, due to the presence of the COVID-19 pandemic. The testing only extended to teacher responses, which means the researcher was unable to conduct feasibility testing with students. For future researchers, it is recommended to proceed to the next phase to assess the suitability of the developed product.

Based on the validation results from the three experts and teacher responses, an average score of 87.18 was obtained, categorizing it as "Very Good." The assessment results from the quality test lead to the conclusion that the focus media with a STEM approach based on project-based learning, focusing on the content of theme 8 "My Place's Region," subtheme 2 "Lesson 2," is highly effective for instructional purposes.

Based on the findings of this study, the experts provided several suggestions and recommendations for the developed product: (1) The components on the media's cover page should be completed. (2) The font size of the text within the focus media content should be increased to enhance readability. (3) The alignment and color of the background media focus should match the text. (4) In indicator 4.3.1 of the subtheme's learning objectives, its implementation was not visible. It would be better to incorporate student activities within the developed product that specifically measures indicator 4.3.1. (5) The scenario or learning activities should differentiate columns between the teacher and the students. As students' learning styles vary, tailoring this model to individual students is suitable, given that students' developmental acceleration always varies due to their unique characteristics

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