Developing teaching materials based on 5E learning cycle in thematic learning of elementary school students

Andi Setiomono1*
Rochmiyati2
I Wayan Distrik3
Muhammad Nurwahidin4

1–4Faculty of Teacher Training and Education, Lampung University, Bandar Lampung, Indonesia

ABSTRACT
This study aimed to develop valid contextual-based teaching materials for fifth-grade of elementary school students. The type of research and development used refers to the R&D theory of Borg and Gall. The research was conducted for fifth-grade students at SDN 6 Bandarjaya. The results of this study indicate that the 5E learning cycle was developed practically based on the results of expert validation obtained an overall average of 80.7%, and the results of the questionnaire response of educators were 77.8% and the results of student responses were 78%–based teaching materials are Learning Cycle 5E feasible to use.

KEYWORDS
Teaching materials; learning cycle 5e; critical thinking

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Introduction
Learning is a system consisting of components that interact with each other as a whole to achieve the learning objectives that have been set previously. Components are part of a system where the system has an important role in the overall course of a process to achieve system goals. Therefore, the educational components are parts of the educational process system that determine the success or failure of the educational process (Slameto, 2003). These components include competency-based learning objectives, students, educators, teaching materials, learning materials, approaches and methods, media or tools, administrative and financial factors.

Teaching materials are a major issue that cannot be ruled out in the teaching and learning process. According to the Ministry of National Education (Hirca, 2011) explains that teaching materials are information, tools, and texts needed by educators or instructors for planning and studying the implementation of learning. Teaching materials are a set of learning materials that refer to the curriculum to achieve the competency standards and basic competencies (Lestari, 2013).

According to Widodo & Jasmadi (2008) teaching materials are a set of tools that contain learning materials, methods, limitations, and ways of evaluating that are designed systematically and attractively to achieve the expected goals, namely achieving competencies and sub-competencies by all its complexity. According to the opinion above, we can also conclude that teaching materials are all materials (both information, tools, and texts) that are systematically arranged that display a complete figure of competencies that will be mastered by students used in the learning process with the aim of planning and reviewing implementation. learning. For example, textbooks, modules, audio or video teaching materials, interactive teaching materials, and so on. Through the teaching materials used in learning, students can understand the material and concepts being studied more easily.

According to Majid (2007) defines teaching materials as all forms of materials used to assist educators/instructors in carrying out teaching and learning activities. The material in question can be in the form of written material or unwritten material. According to Dale (1969), is something that can be used to support and facilitate the teaching and learning process.

According to Prastowo (2013), teaching materials are a set of materials that are arranged systematically, whether written or not to create an environment or atmosphere that allows students to learn. Some argue that teaching materials are information, tools, and texts that are needed by educators or instructors for planning and studying the implementation of learning. The function of teaching materials is as a guide for educators and students in directing learning activities thus learning activities become effective and meaningful (Prastowo, 2013).

The purpose of making teaching materials is as a tool for students in learning activities to make it easier for students to understand the material and make learning activities interesting and fun (Hamdani, 2010) and (Prastowo, 2013). The benefit of making teaching materials is to facilitate learning activities thus both educators and
students are more motivated. If the teaching materials used are following the material being taught, the learning will take place more interesting so that the objectives of the learning will be achieved (Abidin, 2014).

According to Nasution (2006) says that the module can be formulated as a complete unit that stands alone and consists of a series of learning activities that are structured to help students achieve several goals that are formulated specifically and clearly. According to Daryanto (2013), the module is a form of teaching material that is packaged completely and systematically, and it contains a set of learning experiences that are planned and designed to help students master specific learning objectives.

According to Daryanto (2013) conveys several characteristics that need to be considered in developing the module: Self-Instruction, Self-Contained, Stand Alone, Adaptive, and User Friendly. The Ministry of National Education (Hirça, 2011) states that the learning objectives of the module are as follows: a) Clarify and simplify the presentation of the message thus it is not too verbal. b) Overcoming the limitations of time, space, and senses, both students and educators/instructors. c) To be used appropriately and varied, such as to increase motivation and passion for learning. d) Develop the ability to interact directly with the environment and other learning resources that allow students to learn independently according to their abilities and interests. e) Allows students to measure or evaluate their learning outcomes.

The module components according to Mustaji (2008) with modifications are concept maps, formulation of instructional objectives, instructions for using the module, learning activities, summaries, enrichment/student worksheets, evaluation sheets (competency test), and a glossary. Based on the components of the module, the format of the thematic modules for Theme 8 sub-theme 3 was obtained, namely: cover, preface, table of contents, module components (concept maps, formulation of instructional objectives, instructions for using modules, learning activities, summaries, enrichment/sheets). Student work, evaluation sheets, glossary, and bibliography.

Karpplus introduced a learning cycle, several different developments have been made to increase the number of phases in this model. However, this does not reduce the essence of the origin of the learning cycle (Hanuscin & Lee, 2008). Among the developments of the model are the learning cycle 5E engagement, exploration, explanation elaboration and evaluation.

Methods

The methods explain clearly how the author carried out the research. The method must describe the research design clearly, the replicable research procedures, describe how to summarize, and analyze the data.

Types of Research

This research is development research that uses Research and Development (R&D). According to Sugiyono (2013) explains that R&D is a research method used to produce certain products and test their effectiveness of these products. This study aims to develop teaching materials based 5E learning cycle in integrated thematic learning for fifth-grade elementary school students.

The steps of R&D can be seen in the image below:

![Figure 1. Development Design (Borg & Gall, 1989)](image)

Based on the development research steps used, the researchers took research steps from step 1 to step 34. Of course, this is due to the limited time and expertise of researchers for the next stage and requires no small amount of funds and time.

The sample in this study refers to the opinion of Sugiyono (2013) as purposive sampling, namely taking sample members based on certain considerations. In this study, the samples used were 12 students and 8 fifth-grade educators from SD Gugus Patimura as a small group trial sample.

The types of data obtained are quantitative and qualitative data. The instrument in this study is an explanation of the data collection techniques used. The instruments used in this study were needs analysis instruments for students and educators, and instruments for the feasibility and practicality of teaching materials (validation by expert lecturers and product users, in this case, the fifth-grade students of 6 Elementary School Bandarjaya). The research method is a test, questionnaire, and observation. Analysis of the data used in the field trials is descriptive analysis techniques, descriptive quantitative, and quantitative analysis.
Expert Validation Analysis

Validation was carried out to determine the theoretical feasibility of the developed teaching materials. This expert validation analysis was carried out by descriptive analysis of the percentage with the formula:

\[ P = \frac{n}{N} \times 100\% \]

Description:
- \( P \) = Aspect percentage level
- \( n \) = Total aspect score obtained
- \( N \) = Maximum number

Table 1. Expert Validation Assessment Criteria

| Level of Aspect Percentage | Criteria       |
|---------------------------|----------------|
| 82% - 100%                | Strongly Feasible |
| 63% - 81%                 | Feasible        |
| 44% - 62%                 | Less Feasible   |
| 25% - 43%                 | Not Feasible    |

Source: (Rusmiyati et al., 2019)

Questionnaire Analysis of Educator and Student Responses

Questionnaire responses of educators and students were carried out to know the practicality of the teaching materials developed. The results of the educator response questionnaire were carried out by descriptive percentage analysis with the formula:

\[ P = \frac{n}{N} \times 100\% \]

Information:
- \( P \) = Aspect percentage level
- \( n \) = Total aspect scores obtained
- \( N \) = Maximum number of

Results

Product Development

Development of teaching materials based on the Learning Cycle 5E of critical thinking skills in thematic learning of theme 3 sub-theme 3 in fifth-grade elementary school adapting the R&D steps from Borg and Gall from 10 steps to 7 steps which can be described as follows;

Research and Data Collecting

The initial stage of the research is a preliminary study through field studies and literature studies. Field studies are carried out by conducting a needs analysis. While the literature study is carried out by reviewing books and sources relevant to the research to be carried out. The results of observations, questionnaires on needs in the field, and specific literature studies have been explained in the background of the problem in Chapter 1.

Planning

Planning carried out by researchers is as follows:
1) Develop a learning design framework
2) Determine the systematic learning design
3) Determine the assessment instrument
4) Develop questions

Initial Product Format Development

The results of the initial product developed in this study are product development steps which are prototype-based teaching materials 5E learning cycle to improve critical thinking skills. This activity is carried out by product mapping including determining the elements of teaching materials consisting of 1) title; 2) instructions for use; 3) KI, KD, and product development goals. The following is a product development table.
Table 2. Development of Initial Product Format

| Element of Teaching Material | Product |
|------------------------------|---------|
| Title | Teaching Material Based Learning Cycle 5E to improve critical thinking theme 3 “Healthy Food” sub-theme 3 “The Importance of Maintaining Food Intake” |
| Core Competencies | based on curiosity about themselves, God’s creatures and their activities, and objects they encounter at home and school. |
| Basic Competencies | Indonesian Language |
| | 3.3 Examining the socio-cultural diversity |
| | Science |
| | 3.3 Analyzing information conveyed by advertisement exposure from print or electronic media |
| | Social Studies |
| | 3.3 Analyzing forms of human interaction with the environment and their influence on development social, culture, and economy of Indonesian society |
| | SBdP |
| | 1.4 Understanding local art works |
| Learning objectives | Objectives The learning objectives in this study are to improve students’ critical thinking skills in grade 5 Elementary School on theme 3 “Healthy Food” sub-theme 3 ”The Importance of Maintaining Healthy Food Intake” using Learning Cycle 5E |

Source: Researcher Analysis

**Initial product trial**

At this stage, the product is validated by experts and tested on practitioners, namely elementary school (SD) educators who already have a master’s or bachelor's degree and are competent in their fields as well as students of SDN Number 6 Bandarjaya.

**Product Validation**

Product validation from experts is used as the basis for revising and perfecting the prototype. Expert assessment is carried out by submitting products based on the Learning Cycle 5E to improve critical thinking skills. Then the expert was asked to assess the suitability of the teaching materials with the indicators on the validation sheet. Aspects that were assessed during this initial field trial included expert validation and the responses of educators and students in small group trials.

a. Validation of Material

Experts Material experts on the development of contextual-based teaching materials to improve critical thinking skills, aiming to get input about the suitability, and correctness of learning materials compiled based on material science. The experts selected as product testers are 2 educators who have a Strata-2 education level.

b. Validation of Media

Experts Media experts for developing teaching materials based on the Learning Cycle 5E to improve critical thinking skills aim to obtain input about the suitability and correctness of learning materials compiled based on media science. The experts selected as product testers are 2 educators who have a Strata-2 education level. The validator guides and directs the aspects of media suitability and content quality in teaching materials based on the Learning Cycle 5E to improve critical thinking skills.

c. Linguistic

Expert Linguists develop contextual-based teaching materials to improve critical thinking skills, that aim to get input on language accuracy and grammar correctness. The experts selected as product testers are 2 educators who have a Strata-2 education level.

Table 3. Expert Validation Results

| No | Validator | Score |
|----|-----------|-------|
| 1  | Material Expert | 87 %  
|    |            | 85 %  |
| 2  | Media Expert  | 87,5 %|
|    |              | 82,5 %|
| 3  | Language Expert| 75 %  |
|    |              | 67 %  |
|    | **Average** | **80,7 %** |
Results of the Assessment of Education Practitioners

The assessment from practitioners of respondents’ educators is one educator for class VA and one educator for class VB. Aspects assessed by educators are aspects of attractiveness, convenience, and usefulness. Each statement item on the usability or practicality sheet has a maximum score of 4, while the minimum score is 1. The results of the educator response questionnaire are as follows:

| Criteria          | Strongly Practical |
|-------------------|--------------------|
| Source: Primary processing data |

Table 4. Teacher Response Results

| No | Assessed Aspect | Educators |
|----|-----------------|-----------|
|    |                 | 1 2 3 4 5 6 7 8 |
| 1  | Attractiveness  | 25 24 24 25 24 25 26 |
| 2  | Easiness        | 22 21 21 23 22 22 22 |
| 3  | Usefulness      | 9 9 9 10 9 9 9  |
|    | Total Score     | 56 54 54 58 55 55 57 57 |
|    | Maximal Score   | 72 72 72 72 72 72 72 72 |
|    | Score Percentage| 79 75 75 81 76 76 80 80 |
|    | Average Percentage| 77.8% |

Source: Primary processing data

Aspects assessed by educators have 3 aspects, namely attractiveness, convenience, and usefulness, the results of the assessment obtained a total score of 24 with a percentage of 77.75%. Thus it can be concluded that the product according to the assessment of educator practitioners can be categorized as practical.

Small Group Trial Assessment Results from Small group

Trial subjects were students with a total of 5 participants. 3 aspects are assessed by the small group trial participants on Learning Cycle 5E. The data collected in the small group trial is shown in table 5 below.

Table 5. Small Group Trial Results

| No | Assessed Aspect | Percentage per aspect | Criteria          |
|----|-----------------|-----------------------|-------------------|
| 1  | Attractiveness  | 77%                   | Strongly attractive |
| 2  | Easiness        | 78%                   | Strongly easy      |
| 3  | Usefulness      | 79%                   | Strongly useful    |
|    | Average Percentage| 78%                   |

Source: Primary data processing

Data from the assessment of participants in the small group trial, the attractiveness aspect obtained an average score of 77% with very attractive criteria, the ease aspect obtained a score of 78% with very easy criteria, and the usefulness aspect obtained a score of 79% with very useful criteria. The aspects assessed in the small group trial along with the results of the small group trial assessment above illustrate that the more people who rate the product, the more perfect the product developed. This product developed aims to improve the product before the product is tested in field trials.

Discussion

Practicality

The practicality of teaching materials based on Learning Cycle 5E to improve critical thinking skills is seen from the results of validation trials, small groups, and practitioners using practical response questionnaires. The average results from material expert validation are 86%, the average results from media expert validation are 85%, and the average linguist validation results are 71% with feasible and practical categories. The research above is following Abidin (2014) theory that aspects of teaching materials must include aspects of the material, presentation, and language that must be considered to create appropriate teaching materials. The response of students is 78%, and the response of educators to the questionnaire stated that the developed teaching material instrument has benefits, especially with the 5E learning cycle of students. This is following research Suniasih (2019) which explains that teaching materials are said to be practical if student responses show the ease of use of teaching materials for students, the media used in learning are easy to obtain and easy to use in the learning process. Meanwhile, teaching materials that are practically used by educators and students according to Gravemeijer et al (2013), are seen from whether educators and students can use these teaching materials easily, and also results show that these teaching materials meet the needs and are following the objectives. learning. Based on these explanations in the form of the results of the practicality response test of
educators, evidenced by theories and previous relevant research results with aspects of attractiveness, convenience, and usefulness, an assessment of the practicality of teaching materials was obtained.

**Conclusion**

Teaching materials based on the Learning Cycle 5E are theoretically and practically feasible to improve students’ critical thinking skills in thematic learning of theme 3 sub-theme 3 for fifth-grade elementary school. The product of this research has been validated by material experts at 86%, media experts at 85%, and linguists at 71%, as well as the response of educators as practitioners at 77.8% and the response of small group trials at 78%, the validation results are in the feasible category and practical.

**Implications**

Teaching materials based on the Learning Cycle 5E are feasible and practical to use in the learning process of students and can be used in the thematic learning process for fifth-grade elementary school and serve as a reference and guide for educators to develop teaching materials in the future. Teaching materials based on the Learning Cycle 5E are feasible and practical and make it easier for educators and students to carry out learning thus learning objectives can be achieved optimally.

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