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TÍTULO: Fortalecimiento del pensamiento crítico de los estudiantes para maestros de educación primaria mediante el desarrollo de libros de texto de matemática básica basados en habilidades para la vida y resolución de problemas.

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RESUMEN: Este estudio tuvo como objetivo compilar y desarrollar libros de texto básicos de matemáticas basados en habilidades para la vida y resolución de problemas para el fortalecimiento del pensamiento crítico de estudiantes futuros maestros de primaria. La investigación se realizó utilizando el modelo de Dick y Carey. La prueba sumativa involucró a estudiantes de educación para maestros de escuela primaria en la Universidad Estatal de Malang y la Universidad Blitar Nahdlatul Ulama. Se utilizó estadística descriptiva. Se obtuvo como resultado que estos libros de texto fueron útiles para que los estudiantes comprendan conceptos matemáticos básicos a través del fortalecimiento de sus habilidades de pensamiento crítico.

PALABRAS CLAVES: habilidades para la vida, matemáticas, resolución de problemas, libros de texto.

TITLE: Strengthening Critical Thinking of primary school teacher education students through development of Basic Mathematics Textbooks based on Life Skills and Problem-Solving.

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ABSTRACT: This study aimed to compile and develop basic math textbooks based on life skills and problem solving to strengthen the critical thinking of future elementary school students. The research was conducted using the Dick and Carey model. The summative test involved education students for elementary school teachers at Malang State University and Blitar Nahdlatul Ulama University. Descriptive statistics was used. It was obtained that these textbooks were useful for students to understand basic mathematical concepts through the strengthening of their critical thinking skills.

KEY WORDS: life skills, mathematics, problem solving, textbooks.

INTRODUCTION.

The development and changes of this era require individuals to have life skills and self-quality in order to create excellent and competitive human resources (HR). According to Anwar (2012), life skills are a continuation of knowledge and abilities required to become an independent individual. UNICEF (2015) defines life skills as the abilities that exist in humans in the form of behavior that can be used to adjust to their environment so they can effectively face the challenges and demands of daily life, which are generally categorized into three broad areas, i.e., cognitive, personal, and interpersonal skills.

Life skills-based education includes fundamental needs. According to Howe (2009), life skills education provides basic supplies and exercises about the values that are necessary and useful for the development of students' lives. Thus, life skills education should reflect real life in the teaching process so that students acquire the life skills; then, students are ready to live in the midst of a community. The implementation of life skills education varies and is adapted to the child's condition and environment, but maintains the same general principles.

Life skills education can be achieved not only with activities that are direct practice, such as courses and internships, but they can also be inserted into classroom learning and face-to-face interactions. Usually, the life skills value is added to the textbook that will be used. According to Fastre, Klink, & Merrie (2010), the values represented in the teaching material impact directly on the ability and expertise of students to do something. In face-to-face learning, textbooks can be regarded as compulsory books that need to be supplemented by other books that are appropriate to the content of lessons as a form of curriculum application that is directly related to students.

Johnsen (2001) briefly defines textbooks as books used in classrooms and any form of teaching materials disseminated to students. The use of textbooks is part of the book culture, which is one part of an advanced society. The current fundamental change in textbooks is their foundation in supporting the construction of knowledge from their users. This is a drastic shift from the earlier perspective, in which textbooks only transmitted knowledge to students be more developed and formative is closely related to the context of life (Ivić, Pešikan, & Antić, 2013).

This globalization era requires individuals to have critical thinking skills and capable life skills to compete optimally. According to Rich (2008), the formation of life skills is strongly supported by learning activities that exist in daily life and school. However, many teachers who play an essential role in the education world still do not understand the importance of life skills and critical thinking skills in the present. According to Arends (2008) in his 21st-century invention, social issues are

more complex than cognitive capacity, so life will be challenging if students' critical thinking patterns are not prepared. To overcome this challenge, students need to develop learning patterns that are textual, contextual, critical, and problem-solving.

Student activeness will appear if the lecturer provides content in a problem-solving context for students, so they want to develop their mindset and actively express ideas with critical thinking. Moreover, life skills in community life have an important role. Individuals with life skills can make decisions under various conditions and solve problems in the surrounding environment. Without life skills, individuals will experience difficulties in developing themselves. Students can think critically from reasoning out a problem that exists in society if they have understood the society's problems as a whole.

Based on these demands, it is essential to establish an appropriate pattern which can accommodate the needs and respond to the challenges of the 21st century while emphasizing competition and individual quality. Textbooks become an essential part of learning as they are a manifestation of the curriculum that is distributed to users. Based on field observations of textbooks that are circulating in the community in general, the components are still textual and contextual.

This study aimed to compile and develop basic mathematics textbooks based on life skills and problem-solving and strengthening critical thinking for students of primary school prospective teacher. By using textbooks, students can train to understand the basic concepts of the set, kinds of sets, relations on the set, operations on the set, sets of numbers, relation, function, cardinal numbers, mathematical logic, and quantification. The use of textbooks is part of the book culture, which is one sign of an advanced society. A fundamental change of textbooks at this time is to become a foundation in supporting the construction of knowledge from its users.

Therefore, a long-term program is needed; namely, essential mathematics textbooks development in primary school teacher education with textual components based on life skills, problem-solving, and strengthening critical thinking. These needs are in line with the goals (Surya, 2013) of developing an active process and way of thinking regularly and systematically to understand information in depth, then forming a belief about the truth of the information obtained or opinions and books read.

DEVELOPMENT.

Methodology.

The product, in the form of textbooks, was developed based on the model design of Dick and Carey, which has been modified according to the needs of this study and development. Development steps are carried out as in the following chart (*Figure 1*).

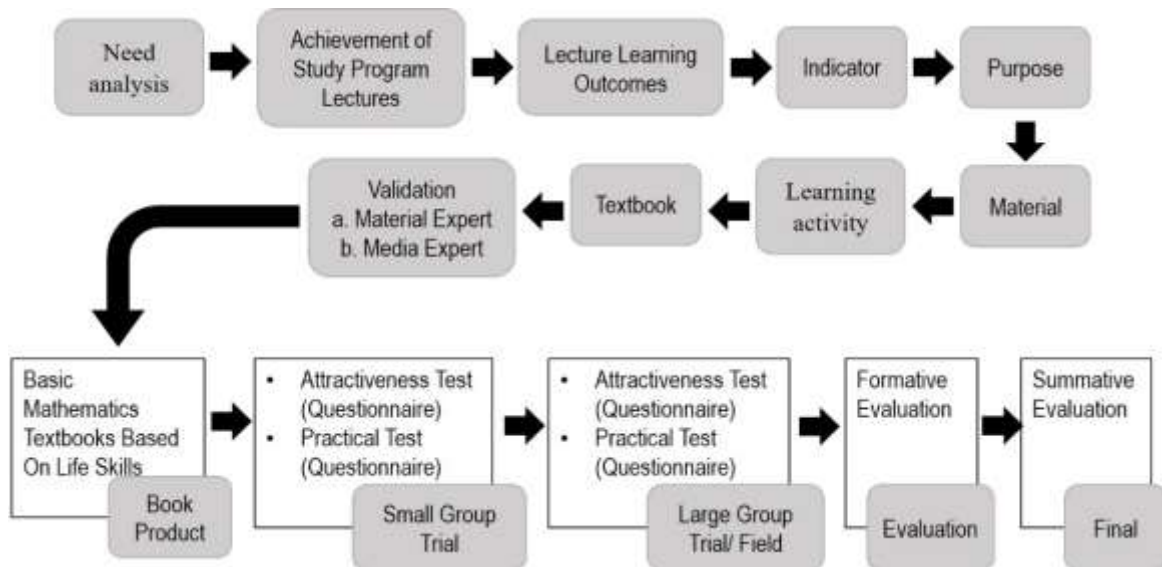


Figure 1. Modification of Dick and Carey

Development Model by Zainuddin According to the development chart above, the steps taken to develop this product are as follows: problem identification and needs analysis. After the preliminary study, the formulation of specific objectives and product design were carried out. This development resulted in products in the form of textbooks that were validated by experts and continued with

product trials, which included a) trial design, b) trial subjects, c) data types, d) data collection instruments and e) data analysis techniques.

The trial design consists of three stages, i.e., a) expert validation, b) small group trial, and c) field trial. The field trial aims to determine the feasibility and effectiveness of products using the following standards: (a) suitability of material, (b) depth of material, (c) ease of use of the textbook, and (d) accuracy of the material.

Subjects of this development study trial included a) an expert validator, and b) PP2 and PP3 primary school teacher education students of Malang State University, as well as primary school teacher education students of Blitar Nahdlatul Ulama University.

The types of data used are qualitative and quantitative, and the data collection instruments in this study were a) an expert validation sheet, b) a primary school teacher education student response questionnaire, c) a test, and d) an interview guideline. Data analysis techniques used were a qualitative descriptive analysis, which is used to analyze data in the form of scores, and a qualitative descriptive analysis, which is used to analyze suggestion data and validator responses.

Results and discussions.

Product development in the form of basic mathematics textbooks based on life skills and problem-solving is one solution for primary school teacher education lecturers and students. Through this product, the lecturer is facilitated by the systematic material content and the lecture content in primary school teacher education. Also, this book can provide a more material and tangible learning experience for students, as well as practical applications. This product has been developed through several stages related to its validity and effectiveness, including expert validation, small group trial, field trial, and effectiveness evaluation. The results of the stages will be explained below.

a. Expert validation results.

After compiling the product in the form of basic mathematics textbooks based on life skills and problem-solving to strengthen critical thinking, the expert validator, a necessary mathematical material expert, carried out an assessment. This expert validation is done to obtain advice, feedback, criticism, and notes that are useful for the improvement of the product being developed. The recapitulation results of the validity test of the textbook products are presented in Table 1.

Table 1 Expert validation results.

No	Aspect	Indicator	Score
1	Feasibility of Content	Suitability of material with competency standards and essential competencies	3
		Material accuracy	3
		Supporting learning material	3
		Material updates	3
		Contain problem-solving	4
2	Feasibility of Presentation	Presentation technique	3
		Presentation support	2
		Presentation of learning	2
		Comprehensiveness of presentation	3
3	General Assessment	Book characteristic	3
		Book principle	3
		Life skills content	4
	Total score		40
	Percentage		83.3%

Based on validity recapitulation data, the product showed valid criteria of 83.3%, indicating that textbooks were suitable for use, but with revisions made based on suggestions, comments, feedback, and notes obtained from the expert validation test. Suggestions and feedback from material experts include:

- a) Adding lecture goals in each sub-chapter according to the topic of discussion.
- b) Formulating practice questions as contextual questions.
- c) Adjusting pictures that represent fractions.

d) Presenting content in the form of questions and reading more contextually regarding the environment and teacher's condition.

b. Small Group Trial.

A small group trial was carried out to obtain data related to attractiveness. Small group trial subjects were 10 2nd-semester students in PP3 primary school teacher education at Malang State University. Students were asked to study and read basic mathematics textbooks based on life skills and problem-solving, then fill in the provided questionnaire.

The results of the attractiveness test recapitulation were 86%, showing that out of 10 study subjects, eight students gave an excellent product assessment, and two students gave a suitable assessment. Through the percentage of products that have been developed get into desirable criteria. In addition to score data, there were several feedback points related to the attractiveness test. Suggestions, feedback, criticism, and responses included: a) some practice questions are difficult to do, b) the question should be more reproducible, c) the picture is related to flat geometry, and space can be clarified adjusted to the material concept.

c. Field Trial.

A field trial using a response questionnaire was conducted to determine the practicality of textbooks used in lectures. The subjects of this field trial were PP2 and PP3 primary school teacher education students of Malang State University and Blitar Nahdlatul Ulama University. The results of the students' practicality test are presented in Table 2.

Table 2. Results of practicality test by students.

No	Aspect	Indicator	Score
1	Display and Content	Text clarity	3
		Image clarity	3
		Material clarity	4
		Suitability of picture with material	3
		Problem-solving content	4
2	Presentation of Material	Systematic	3
		Suitable example with material	3
		Clarity of sentences and terms	3
		Ease of material to be understood	3
3	Benefit and General Assessment	Ease to learn	4
		The attractiveness of the book to be used	3
		Life skills content	4
	Total score		44
	Percentage		91.6%

The average percentage of practicality test results was 91.6%. This percentage showed that the practicality of using basic mathematics textbooks based on life skills and problem-solving to strengthen critical thinking is very practical and meets the criteria for use in lecture activities, especially for a basic mathematics course.

d. Product Effectiveness Test.

Product effectiveness data were obtained based on student learning outcomes, which were measured using a pretest and posttest (before and after learning and understanding basic mathematics textbooks based on life skills and problem-solving). The difference between pretest and posttest scores reflected an average increase in test results, from 57.7 to 80.8% after using basic mathematics textbooks based on life skills and problem-solving. The development results were considered effective because the average value exceeds the expected Minimum Criteria of Mastery Learning, which is 70% (*Figure 2*).

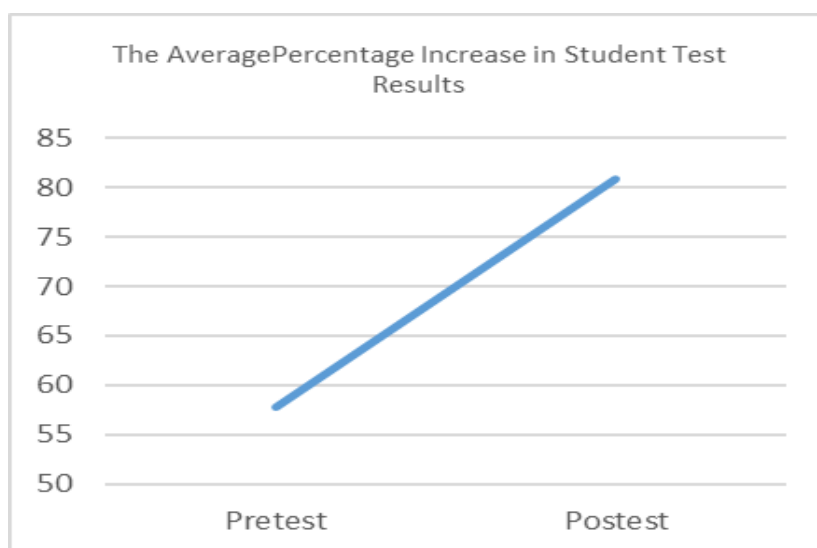


Figure 2. The results of the competency test achieved by students after using the results of essential mathematics textbooks development.

The measurements of the textbooks' effectiveness are the suitability of the material, the depth of the material, the ease of use of textbooks, and the accuracy of the material. This is in line with Akbar's opinion (2015) regarding the criteria of good textbooks: they must be accurate, relevant, communicative, systematic, student-centered, grammatically correct, and legible. At least the making of textbooks meets the requirements regarding the standard content of textbooks, the use of language, and the appropriate form of writing to achieve the standard use of quality textbooks. Based on these criteria, the content of basic mathematics textbooks based on life skills and problem-solving is appropriate for use in learning.

The material expert validation results, small group trial, and field trial showed that these textbooks meet the criteria of being valid, attractive, practical, and effective, and primary school teacher education students can use them. Product validity is seen in the results of the validator's assessment, which states good results in all three areas of material, media, and language. Students' assessment illustrates meeting the criteria of interesting during small group trial. Practicality was illustrated by

students' questionnaire results after the field trial, showing that all students can use the textbooks properly.

A series of trials have been carried out by the prepared plans and instruments, so it can be concluded that contextual-based thematic textbooks that have been developed meet the criteria of being valid, amusing, practical, and are capable of being used in learning. This is supported by the opinion of Akker (1999) that the quality of learning devices is at least evaluated from the criteria of validity, practicality, and effectiveness.

CONCLUSIONS.

Based on the study and development conducted, products have been developed in the form of basic mathematics textbooks based on life skills and problem-solving to strengthen critical thinking for primary school teacher education students. This textbook can help students of primary school teachers hone their life skills and critical thinking skills in order to support their abilities and competencies. Also, it can improve the achievement of prospective teachers while producing qualified human resources in global competition.

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