



Development of a Concrete-Pictorial-Abstract (CPA) Teaching Module to Improve Numeration Literacy for Elementary School Students

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ABSTRACT

This study aims to describe the design of the hypothesis and the feasibility of the Concrete-Pictorial-Abstract (CPA)-based multiplication teaching module to improve the numeracy literacy of elementary school students. The research method used is Design and Development (D&D). This research procedure is Planning, Production, and Evaluation (PPE). This research result is a Concrete-Pictorial-Abstract (CPA) based teaching module on multiplication material in grade II Elementary School. The teaching modules have been validated by three experts: material experts, design experts, and linguists. The validation results from material experts get a percentage of 95%, design experts get a percentage of 89%, and linguists get a percentage of 92.5%. All validation results are included in the excellent criteria. The product was tested on students through a literacy ability test which was carried out through a pretest and post-test. The average result of the students' pretest scores is 50, and the average post-test results are 83. Thus, this teaching module is feasible and can improve students' numeracy literacy.

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1. INTRODUCTION

Education in Indonesia focuses on developing literacy competencies, one of which is numeracy literacy. According to Suryaman (2020), learning will be designed to be meaningful learning according to the context of life. Learning in the curriculum Merdeka will be oriented to competence, not content or material. Learning outcomes in the Kurikulum Merdeka will be contextualized with cognitive and non-cognitive assessments and strengthened by numeracy literacy.

Literacy is considered to have compatibility with thematic learning. Literacy focuses on skills to add to the deep learning experience in everyday life. This makes literacy considered to have compatibility with thematic learning (Setiawan, 2019). This is in line with Nehru, (2019) who said that numeracy skills can be used as capital for students in mastering other subjects.

Numerical literacy is the ability to apply number concepts and arithmetic operations skills in everyday life (Siregar, 2022). The results of the Program for International Student Assessment (PISA) survey, which is an international study under the OECD (The Organization for Economic Cooperation and Development) in 2018, noted that Indonesia's numeracy literacy was ranked 72nd out of 78 countries. With an average score of 379 from the OECD average score of 487. It can be concluded that literacy in Indonesia is still very low.

Considering that Indonesia has a low level of literacy culture, not yet ingrained, and not yet cultivated in the community, making discussions about literacy culture in Indonesia very interesting (Perdana and Suswandari, 2021). Ayuningtyas and Sukriah (2020), also said the survey results were three times shows that students in Indonesia still have mathematical literacy skills very low compared to other PISA participating countries.

Even though there are still many students who do not have good literacy and numeracy skills and considering that this can be utilized in various aspects of our lives, the application of literacy and numeracy skills is very important to access education programs more broadly (Anugrah, 2021). Literacy numeracy is also very necessary to solve problems, both problems that require many ways solutions, unstructured problems and problems that have no resolution at all which is complete and has no relationship with non-mathematical factors (Pangesti 2018).

Ideally, early on, students should start developing numeracy literacy. Numerical and mathematical literacy is based on the same knowledge and skills but differ in empowering these knowledge and skills (Ministry of Education and Culture's GLN Team, 2017, pp. 3). Problems that occur in life are only sometimes structured according to problems in mathematics. Thus, numeracy literacy is not the same as mathematical competence (Ekowati & Suwandayani, 2018, pp. 21). Numerization refers to the skill of applying mathematical rules and concepts in depth real conditions or everyday life (Dantes and 2021). Numerical literacy includes aspects of arithmetic, numeracy relations, and arithmetic operations. These three aspects are basic aspects in learning mathematics and are very important for introduced to students from an early age. (Mahmud and Pratiwi, 2019).

In applying numeracy literacy, educators can create engaging learning activities numeracy in several subjects that will be studied and supported by using methods, models, approaches, and provide media that can make it easier for students to understand the material easy numeration (Yustitia and Juniarso, 2020).

In improving students' abilities, learning in elementary schools is not only limited to referring to knowledge, but also prohibits skills. Students must be able master language

skills (Shabrina, 2022). Safitri et al. (2021: 2986) explained, language can express thoughts and ideas in mind.

Elementary school students are generally still in the concrete operational stage, so learning must be tied to objects captured by the five senses. Abstract mathematical concepts must be strengthened by starting with something concrete so that the concept will last a long time in students' memory and can be applied in numeracy literacy.

However, based on observations at an elementary school in Bandung, there is one problem related to learning mathematics and numeracy literacy. Students need help understanding the essential concept of multiplication because learning focuses on memorization and only comes from the teacher and sourcebooks. Thus, when the application of mathematical concepts in numeracy literacy is still relatively low, the result is that only 28% of students in one class get scores above 70.

Another problem Aan Yuliyanto et al.'s research (2019) found is that low learning outcomes are due to the dense curriculum, media, and less effective learning strategies, so learning is still conventional. Furthermore, learning that has been designed with sufficient time is needed to get maximum learning outcomes. The solution used is learning with the Concrete-Pictorial-Abstract (CPA) approach, which is expected to improve student learning outcomes.

Seeing this background, the researcher will develop a teaching module according to the CPA approach. *Teaching modules* are tools used to achieve learning outcomes in the Kurikulum Merdeka. The teaching module contains activities that students can do to understand the concept of multiplication, materials, and examples of multiplication problems associated with numeracy literacy. Students can apply it in their lives and strengthen the material.

2. LITERATURE REVIEW

Learning outcomes in the Kurikulum Merdeka are in the form of paragraphs or narratives, which are a series of knowledge, skills, and attitudes as a continuous process unit. Complete learning outcomes have been regulated in the Decree of the Head of the Educational Standards, Curriculum, and Assessment Agency of the Ministry of Education and Culture Number 033 concerning Learning Outcomes. Learning outcomes are arranged in phases, not years. The teaching module has a role like lesson plans in the previous curriculum. (Center for Learning and Assessment, 2022, pp. 23).

A Concrete-Pictorial-Abstract approach is an approach adapted from Bruner's learning theory, namely enactive (concrete), iconic (pictorial), and symbolic (abstract) (Chang, Lee, Koay, 2017, pp. 4).

According to Wahyuningsih (2021, pp. 2), numerical literacy is the ability to apply number concepts and arithmetic operations skills in everyday life (for example, at home, work, community life, and as citizens) and the ability to interpret quantitative information contained in around.

3. RESEARCH METHODOLOGY

This study uses the Design and Development (D&D) method. This method is used to study the design, development, and evaluation processes to create a product. This research focuses on developing the design of teaching modules and their feasibility in solving problems. The model used is PPE, namely Planning, Production, and Evaluation (Ulwiyah et al., 2022).

At the Planning stage, curriculum analysis and design of teaching modules are carried out. The Production stage makes teaching module products based on the CPA multiplication material approach. At the evaluation stage, validation of the feasibility of the teaching module was carried out by material experts, design experts, and linguists using a questionnaire.

Table 1. Likert Skala Scale Scoring

No.	Scale	Interpretation
1.	5	Very Good
2.	4	Good
3.	3	Enough
4.	2	Not good
5.	1	Not very good

(Source: Sugiyono, 2015, pp. 94)

The scoring data using a Likert scale, then calculate the average percentage of each component using the feasibility value formula. Eligibility Score (%) = (Total score of respondents)/(Highest Score) x 100%

In addition, limited trials were conducted on students related to literacy skills. The tests were in the form of a posttest and a pretest. The questions are in the form of 10 descriptions according to evaluation sheet one and evaluation sheet two, which are designed in the teaching module.

4. RESULT AND DISCUSSION

This research focuses on phase B grade 3 Elementary School. The content element used is a number element, with the final competence of students being able to perform multiplication operations of whole numbers up to 100. After analyzing the curriculum of the final competence, specific learning objectives for multiplication material are prepared. The learning objectives are in the form of details of competencies and the scope of learning materials as shown in **Figure 1**. The competencies used are adjusted to Tighe and Wiggins' theory contained in the 2022 learning and assessment guidebook.

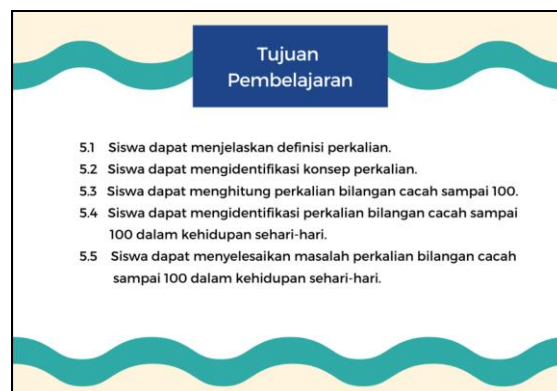


Figure 1. Learning objectives

In achieving the learning objectives, an iceberg (iceberg) is made regarding the multiplication material before entering the learning activity steps. Icebergs are made according to CPA approach as shown in **Figure 2**.

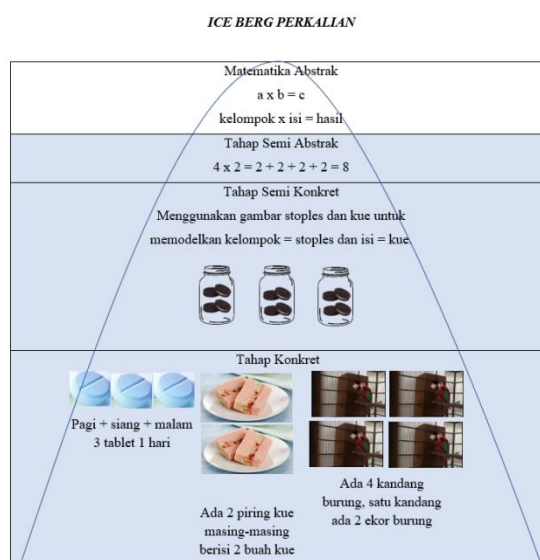


Figure 2. Ice Berg Multiplication Material

Following the CPA learning will begin with something concrete, such as asking and answering questions about problems that exist in everyday life-in addition, using concrete objects that are around, such as stationery, books, tables, chairs, and others. Objects can be living or non-living objects that can be observed, touched and absorbed during the learning process (Pertwi, 2018, pp. 176).

Furthermore, at the pictorial stage, objects can be expressed in the form of drawings or lines. In this study, images are used to represent concrete objects. In learning mathematics that is abstract, images can serve to help students understand the problem. In addition, according to Anita (2022, pp. 87), students can quickly absorb pictures to help them understand the information conveyed.

The last stage of learning is the abstract stage. At this stage, concepts and calculations in multiplication material will use numbers or mathematical symbols.

Learning activities in the teaching module are divided into two lessons. The first lesson uses learning objectives 5.1 to 5.3 related to definitions, concepts, and counting multiplication. Meanwhile, for the second learning, learning objectives 5.4 and 5.5 are related to numeracy literacy. Student Worksheets and teaching materials are adjusted to the learning activities.

The hypothetical design of the multiplication material teaching module based on the CPA approach contains three components: general information, core components, and attachments. General information includes school identity, subject domains, initial competencies as prerequisites, student profiles of Pancasila, learning models, learning methods, infrastructure, student targets, and teaching materials. The core components contain learning outcomes, objectives, trigger questions, meaningful understanding, learning activities, assessment, remedial, and enrichment. This can be seen in **Figure 3**.



Figure 3. General Information

In the first learning activity as shown in **Figure 4**, multiplication material is taught using the CPA approach. The first stage is concrete; at this stage, students learn to use objects around them to help model the concept of multiplication. In the first learning activity, the representation of the concrete object used is a picture of a cake. The next stage is pictorial; at this stage, students represent concrete objects using pictures. The last stage is abstract; at this stage, students represent images in the form of numbers related to multiplication as repeated addition.

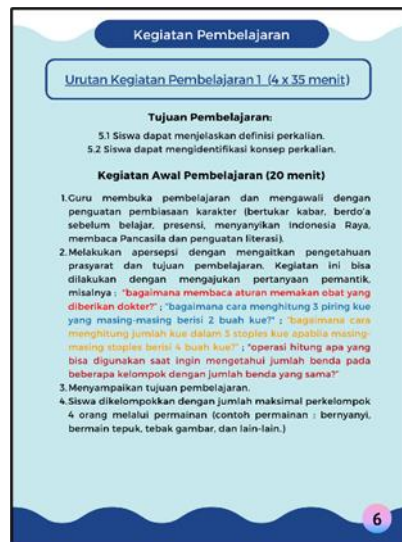


Figure 4. First Learning Activity

In the second learning activity, the learning carried out is directed at numeracy literacy. So, the learning is also related to problems in everyday life about multiplication. The problems presented are also adapted to the CPA approach. The second sequence of learning activities can be seen in **Figure 5**.



Figure 5. Second Learning Activity

The attachment contains student worksheets, teaching materials, evaluation sheets, remedial and enrichment sheets, answer keys, a glossary, and a bibliography. Student worksheets are used for learning one and learning 2. Evaluation sheet 1 contains five description questions, and evaluation sheet 2 contains five description questions as well. The remedial sheet contains five multiple-choice questions, and the enrichment sheet contains three description questions. An overview of these attachments can be seen in Figure 6, Figure 7 and Figure 8.



Figure 6. Student Worksheet

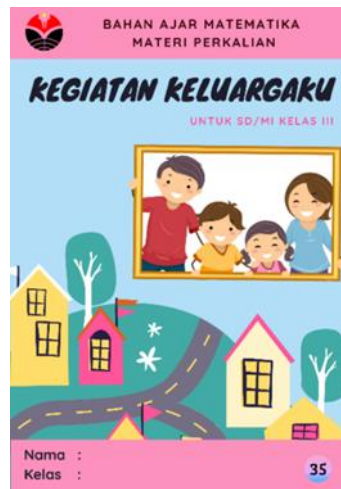


Figure 7. Teaching Material



Figure 8. Evaluation Sheet

The teaching module got a 95% feasibility value after material experts carried out the validation results. The Likert scale scoring table shows that the 95% value is included in the very good criteria. The indicators used as references in the validation of eligibility by material experts are teaching modules, teaching materials, and student worksheets which are seen from the suitability of components, suitability of materials with learning outcomes, suitability of learning activities with the Concrete-Pictorial-Abstract (CPA) approach and numeracy literacy level.

The validation results from design experts and teaching modules get 89% with very good criteria assessment indicators related to cover design and content, fonts, colors, layout, and appearance. At the same time, the results of the validation of linguists scored 92.5% related to the use of sentences, conformity with students' cognitive development, and clarity of letters in the teaching module.

Limited trials were conducted to test students' literacy skills. The research product tested on students is a teaching module that has received suggestions for improvement from experts regarding the Student Worksheet (LKPD), teaching materials, and evaluation sheets. Learning is carried out following learning activities designed and written in the teaching module. Before the activity started, students were given a pretest, and after using the

product, they were given a post-test. The questions used are five questions on evaluation sheet 1 and 5 questions on evaluation sheet 2.

The average score of the students' pretest results is 50. At the same time, the average post-test results are 83. It can be seen that the average value of the post-test results is more excellent and significantly different from the pretest score ($83 > 50$). So, the difference in the results of the pretest before learning and the post-test results after learning individually and on average increased significantly. Thus, from the literacy test, there was an increase after the implementation of the CPA approach-based learning.

4. CONCLUSION

The teaching module is a lesson plan plus in the curriculum Merdeka. The process of developing teaching modules starts with determining the learning phases and achievements, learning objectives, sequences of learning activities, assessments, and attachments. Attachments include Student Worksheets, teaching materials, and evaluation sheets. The resulting product is a teaching module based on the CPA approach and is feasible to use after being validated by experts and can improve the numeracy literacy of third-grade elementary school students.

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