Need Analysis of Active learning Model Development Based on Concrete Pictorial Abstract Approach to Increase Primary Students' Numeracy Ability

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Abstract. The students in one of the private schools in Banjar Agung, Lampung, still have a low level of numeracy ability based on the results of the Minimum Competency Assessment. This need requires the development of learning models to improve the numeracy ability of grade 4th students. The main first step in developing a learning model is doing an instructional needs analysis. The purpose of this research is to conduct a needs analysis for developing an active learning model, through Concrete Pictorial Abstract (CPA) approaches, in increasing the numeracy ability of primary school students. The research method used was descriptive qualitative, with preliminary study techniques. It is taking data from interviews, questionnaires, national assessment results, and learning schedule documents. The research subjects were 2 homeroom teachers and 51-fourth-grade students at a private school in Lampung, located at Banjar Agung. Data analysis techniques refer to the four areas of needs analysis: audience, situation, issue, and media analysis. Based on the results of the needs analysis carried out, there is a performance gap between the characteristics and learning needs of students and the teacher's teaching ability. Students have high motivation and study habits, but teachers have not designed learning including maximizing media effectively in teaching basic mathematical concepts, causing low student numeracy skills. Therefore, it is necessary to develop a CPA-based active learning model to improve the numeracy ability of elementary school students.

Keywords: active learning model, Concrete Pictorial Abstract, numeracy ability.

1 Introduction

Indonesia ranks 62nd out of 70 countries based on the results of numeracy literacy tests conducted by PISA (Program for International Student Assessment) in 2021.

This condition is to be an alarm for all stakeholders of Indonesian educational institutions, especially educators. We must move together to make changes toward increasing levels of literacy and numeracy of Indonesian students. Minister of Education Nadiem Makarim also mentioned that we need to acknowledge low numeracy literacy outcomes of Indonesian students. Then, think about the strategies to improve numeracy literacy skills.

The government expects students to have numeracy and literacy skills as part of implementation the Merdeka Curriculum. Both abilities need to raise early because they become a strong foundation for students to continue their education and be able to solve everyday problems. Based on the data found, students in one of the private schools in Banjar Agung, Lampung, still have a low level of numeracy and literacy skills based on the results of the Minimum Competency Assessment. 50% of students still at the lowest level and need interventions. This study was limited to aspects of numeracy ability.

The existence of this need requires a strategy to improve the numeracy ability of fourth grade students through research and development, including the development of learning models. However, before developing learning, it is necessary to conduct a needs analysis so that the resulting product can effectively improve numeracy skills. Purpose of this research is to conduct a needs analysis for developing an active learning model through Concrete Pictorial Abstract (CPA) approach to increase the numeracy ability of primary school students.

1.1   Need Analysis

The first step in the sistematic design instructional, including develop learning model, are conducting a need analysis. After that, the steps are identifying instructional goals, designing assessment instruments, compiling learning strategies, and creating learning material. Need analysis is a process determining the needs and analyzing the reasons for performance gaps. Needs are the gap between ideal or supposed conditions and actual conditions. Need analysis is a significant concept because it is not only identifies the desired goal but also attempts to measure the current state so that progress toward achieving the goal can be measured [1] [2]. Need analysis is also said to be a frond-end analysis that are consists of performance analysis, need assessment, and job analysis. In this context, performance analysis can refer to student learning performance. Need assessment has also been mentioned as a discrepancy analysis, which analyzes the observed differences between expected and actual conditions [3]. In line with this, need assessment focuses on determining the current and desired state, even the type of business problem that arises from its need. A front-end analysis with a results-driven solution is due to cover the gap. There are ten types of front-end analysis: audience analysis, technology analysis, situation analysis, task analysis, critical incident analysis, objectives analysis, issue analysis, media analysis, extant data analysis, and cost analysis [4].

This study uses four types of frond-end analysis. 1) Audience analysis. Determine who the target population for the study is, students, their characteristics, and learning needs. 2) Analysis of the situation. Determine environmental considerations that af-

fect the learning environment and study time. 3) Issue analysis. Categorize the findings of the analysis as problems, for example, school problems or student performance, that is taken into considerations in concluding. 4) Analysis media. Choose the most appropriate learning media to use.

1.2   Numeracy Ability

Numeracy ability is a foundational knowledge and skill that must be owned by a student. The intended ability is an ability that includes knowledge and skills in 1) using numerical numbers or symbols related to mathematics in everyday life; 2) analyze the information permitted in the form of graphs, drawings, maps, etc.; 3) interpret or predict something, to make decisions [5]. Numeracy ability has interpreted as the ability to think by using concepts, procedures, facts, shapes, symbols, and numbers, related to mathematics, to solve everyday problems, in various types of relevant contexts, to make decisions.
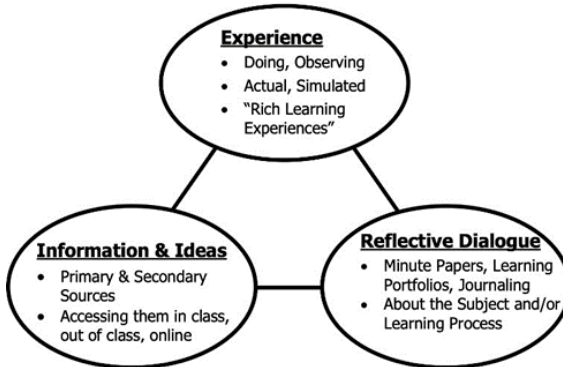
   Nisa (2003) said that students with good numeracy skills will have good learning achievement. On the other hand, if students do not have qualified numeracy skills, it will influence low learning achievement [6]. Numeracy ability is not only needed at school, but also in every aspect of life, both at home, in the office, and the community. In every day, when planning something, such as vacation, or shopping, even when cooking or concocting something, of course, requires the ability to estimate, calculate, analyze, to make decisions that are considered exact and as expected.

1.3   Active Learning Model

      Active learning is an approach that involves student participation in the learning process by building knowledge and understanding. In school, students will typically do this in response to learning opportunities designed by their teachers (Active Learning, n.d.) [7]. Bonwell and Eison (as quoted in Fink, 2013) said that active learning proponents, describe active learning as "engaging students in doing things and thinking about the things they do." By "doing something", they refer to activities such as simulations, small group problem-solving, case studies, and so on [8]. Active learning refers to a variety of teaching strategies that involve students as active participants in their learning during class time with their instructors/teachers [7]. Based on this definition, active learning is a learning that actively involves students in learning activities to build knowledge and understanding what they have learned.

      Stephen, Martlew, and Ellis (2010) emphasized that primary school active learning is often presented by distancing students from passive listening and replacing worksheets with activities such as counting and adding animal models, actions, songs, and artwork to practice phonics or problem-solving in construction projects [9]. Fink (2013) develops a broader and holistic understanding of active learning by creating a complete set of learning activities capable of achieving significant learning, which includes "getting information and ideas", "experience" and "reflection" [9]. A new conceptualization of active learning, which makes all three modes of learning an integral part of a more complete set of learning activity, it can be seen in Figure 3.

A HOLISTIC VIEW OF ACTIVE LEARNING

Experience
- Doing, Observing
- Actual, Simulated
- "Rich Learning Experiences"

Information & Ideas
- Primary & Secondary Sources
- Accessing them in class, out of class, online

Reflective Dialogue
- Minute Papers, Learning Portfolios, Journaling
- About the Subject and/or Learning Process

Fig. 1. Active Learning Conceptualization

In this study, an active learning model using the CPA approach has chosen as a solution to improve the numeracy ability of fourth grade students in learning. Students are actively involved in learning and experience a rich learning of as it is facilitated by a CPA approach that uses concrete objects and images to build students' understanding of concepts. Furthermore, students are invited to reflect on what they have learned so that students are encouraged to apply concepts in everyday life, especially in problem-solving.

1.4   Concrete Pictorial Abstract

Psychologist Jerome Brunner in Kurniawan, et al. (2020), said that the learning process should not be done by memorizing, but by developing students' intellectual abilities through 3 stages, namely inactive, iconic, and symbolic [10]. These three stages can be applied in all fields of science, one of which is mathematics, which is then known as Concrete Pictorial Abstract (CPA).

According to Anita (2022), basically, the material in mathematics is abstract. The point is that the object is abstract, as well as its operations and principles [11]. Therefore, an approach is needed that can help students to solve problems by understanding the concept of numeracy. According to Chang, Lee, and Koay (2017), the Concrete Pictorial Abstract approach, is a numeracy approach using 3 stages, namely the enactive stage (concrete), the iconic stage (pictorial), and the symbolic stage (abstract) [12]

According to Syafira, Fitriani, and Darmayanti (2023), numeracy learning objectives can be achieved through the CPA approach. It can be started at the concrete stage by introducing students to the concept of numeracy and the concrete objects around it. [13]. The objects in question are those that can be seen, touched, or held such as books, pencils, erasers, fruits, spoons, forks, plates, shoes, chairs, clothes, pants, and so on. Pertiwi (2018) also said that objects that are concrete objects are objects that can be seen and even observed by students [14]. This initial stage is very helpful for students because according to the stages of development of elementary

school children, it is usually still in the concrete stage or still difficult with abstract things. The next stage is the pictorial stage, which is to use images or lines, to represent or manipulate concrete objects into the form of images. The last stage is the abstract stage, where drawings or lines are then converted into numbers or mathematical symbols.

Some of the advantages of using the CPA approach are 1) helping students learn mathematical concepts in a coherent and structured manner; 2) helping students think logically from concrete to abstract objects; 3) multi-sensory learning; and 4) Students more easily understand basic mathematical concepts [15].

2   Method

The research methodology for developing learning models uses research and development methods that consist of the steps, 1) assess the need to identify goals, 2) conduct instructional analysis, 3) analyze learner and context, 4) write performance objectives, 5) develop assessment instruments, 6) develop instructional strategies, 7) develop and select instructional material, 8) design and conduct a formative evaluation of instructional, and 9) revise instructional [16]. This article focuses on need analysis as a preliminary study which is described qualitatively. The research schedule for this first phase starts from March - June 2023. Data and information collection instruments using data from interviews, questionnaires, national assessment results, and learning schedule documents. Data analysis techniques are due using four types of front-end analysis; audience, situation, issues, and media analysis. Audience analysis using data from questionnaires, situation analysis using data from interviews and learning schedule documents, issues analysis using data from national assessment results, and media analysis using data from interviews. The research subjects were 2 homeroom teachers and 51-grade 4th students at a private school in Lampung, located at Banjar Agung

3   Result and Discussion

The results of interviews, questionnaires, national assessment results, and learning schedule documents were analyzed into four areas, audience, situation, issues, and media analysis.
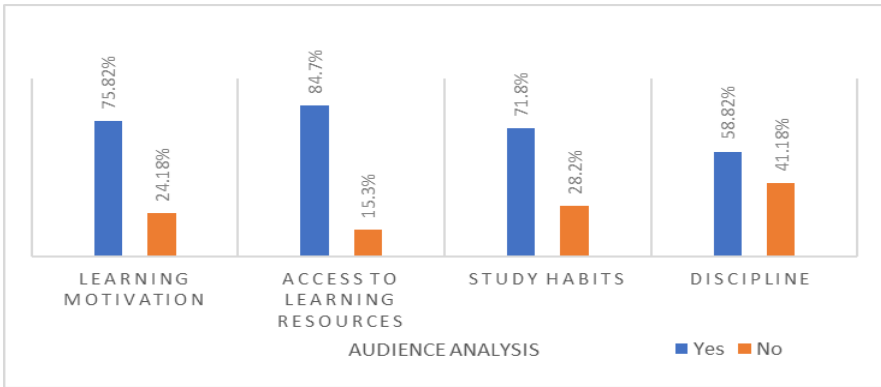
3.1   Audience Analysis

Audience analysis aims to determine the research subject, characteristics, and learning needs of students. Analyze the characteristic and learning needs of students, covering analyzing learning motivation, access to learning resources, study habits, and discipline in managing time. This information is obtained through questionnaires.

The subjects of this research were in fourth-grade elementary schools aged 9-10 years with 51 children. Fourth-grade elementary school students were chosen as re-

search subjects because when in fifth grade they will do a numeracy test. The results of this analysis can be an input for improving numeracy skills.

The aspect of motivation is measured based on students' enjoyment in learning and doing assignments, as well as curiosity about Math lesson. The ability of students to access learning resources is measured by ownership of printed books, having laptops/gadgets to access online materials, and ease of contacting teachers and libraries. The study habits are measured by listening to the teacher's explanation, independent study or assisted by parents, and book reading. The aspect of discipline in managing study time is measured by managing a regular schedule in studying.

Fig. 2. Audience Analysis Diagram

Figure 2 show that the motivation of the students in learning mathematics reached 75.82%, students who could access the learning resources reached 84%, students who had good learning study habit reached 71, 8% and students have discipline in learning reached 58.82%. This result shows that the high motivation, access, and learning habits of students should be directly proportional to the level of numeracy ability.

3.2   Situation Analysis

Situation analysis focuses on considering the learning environment and the mathematics learning schedule for one week. The student learning environment is seen from the aspect of the teaching and learning process in the classroom. This involves the application of learning methods used by teachers, learning tasks, assessments, Mathematics competencies (knowledge, attitude, skills). The aspect of knowledge cover mastery of mathematical concepts, attitudes; confident, courageous, active, and skill; problem solving. Based on the results of student and teacher interviews, interconnected results can be obtained. The teachers interviewed were 2 homeroom teachers and 12 fourth-grade students with heterogeneous abilities (high, medium, and low).

The one-week math lesson schedule for grade 4th students gets six Math learning sessions in one week. One session equals 50 minutes. This surpasses the normal session set by the government which is only five sessions a week [17].

Table 1. A performance gaps.

Aspect	Actual condition	Expected condition
Learning model	Teacher: The method used is drilling, lectures, and practice questions. Methods are less varied. Students: the teacher explains more on the board, repeats the material	Learning models that can improve numeracy skills
Assessment task	Teacher: Homework, doing problems test Students: doing test	Assignments are varied so that they can help students conceptualize. For example, projects, case studies, doing problems
Competence 1. Knowledge: Mastery of Math concepts	Teacher: the average student has difficulty understanding ma-thematic concepts. Materials that are difficult to understand are multiplication, division, calculation operations, roots, ranks, and understanding story problems. Students: understand Math concepts as they are repeated and if given examples. Obstacles to understanding concepts because the material is difficult and learning activities are boring. Difficult material concepts; Highest Common Factor, Lowest Common Multiple, round numbers, plane figure.	Students can master mathematical concepts
2. Attitude: Confident, courage, active	Teacher: Students are quite confident and active in asking questions and doing questions even if there are wrong answers. Students: If you don't understand asking questions to the teacher, you are confident because you can answer the questions but on the contrary, you are not confident if you can't answer the questions, and afraid of being wrong if asked by the teacher to do the questions on the board.	Students have a confident, courageous, and active attitude during the learning process
3. Skill Problem solving	Teacher: Students are still lacking in doing story problems that require high-level thinking. Students: There are questions that can be done and some that can't, questions that	Students have problem-solving skills through learning mathematics

are too many that they can't be done

Based on the results of this questionnaire, teacher pedagogy factors are very important in improving students' numeracy ability, including teachers' ability to design holistic, active, and fun learning. Through six Math lesson sessions for one week, students should have many opportunities to improve their numeracy ability.

3.3   Issue Analysis

Issue analysis sees aspects of the analysis findings as a problem. In this case, the results of the minimum competencies assessment conducted by the government on the numeracy ability of fifth grade students have become an issue to be considered. The Ministry of Education and Culture has organized numeracy measurements every year for elementary school students as a benchmark for schools in Indonesia. One of them is a private school in Banjar Agung.
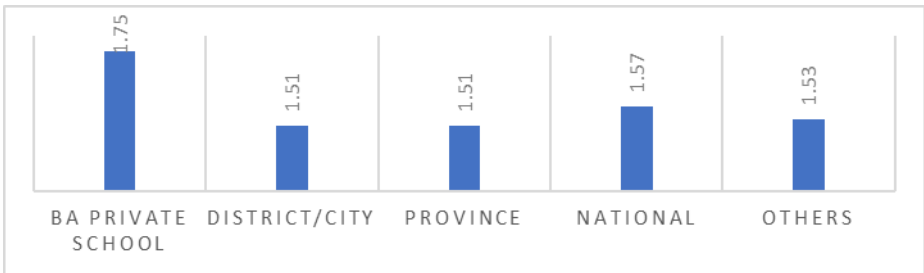

Fig. 3. Comparison of Numeracy Average Score

Figure 3 shows that the numeracy score is already above the average score when compared to the score of Banjar Agung City, Lampung Province, and even above the national average score. However, this score is still small when compared to the target of the Ministry of Education and Culture, which is 100% of students in each school are at the capable level.

The results of obtaining numeracy scores from one of the private schools in Banjar Agung can be seen in more detail in Figure 4. As many as 3.33% and 46.67% of students have proficient and capable numeracy skills. The remaining 50% are still at the basic level and specific interventions. This means that the percentage of learners based on the ability to think using concepts, procedures, facts, and mathematical tools to solve everyday problems in different types of relevant contexts, does not fill the requirement. Based on this data, it can be concluded that the numeracy score of private schools in Banjar Agung is still relatively low and still needs to be improved.
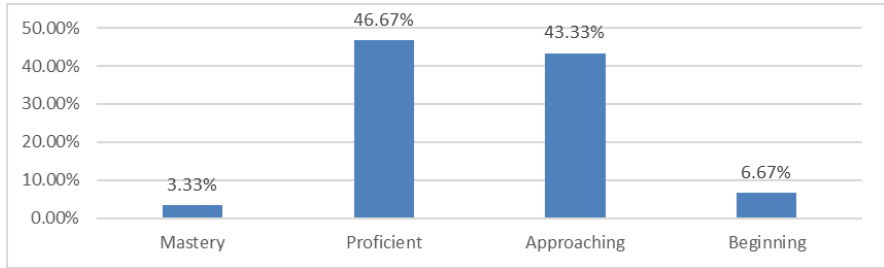
Fig. 4. Numeracy Proficiency Level of Banjar Agung private school

3.4   Media Analysis

Media analysis aims to analyze which learning media is most appropriate to use. In this case, we can see the media used in the Math lesson and its effect on student learning. Based on the results of teacher and student interviews, there are similar responses. Teachers do not use diverse learning media in explaining concepts. Teachers use learning media that exist at that time, for example, using textbooks as examples in explaining the concept of plane figures. Teachers use learning media that exist at that time, for example, using textbooks as examples in explain the concept of plane figures. They lack creativity in providing learning media and do not design the required learning media even though they are browsing the internet, busy work as a teacher and backgrounds of education not in accordance with the Math. Students say that they can learn more effectively if they use media or concrete examples or games so that they better understand what is explained by the teacher.

The results of the need analysis show that students' learning motivation is in a good category, but the results of the national assessment do not show similar results. Even though several studies have shown that there is a high relationship between learning motivation and learning outcomes. One of them is shown by the results of research by Palittin, Wolo, and Purwati (2019) which states that high learning motivation will have a positive impact on learning outcomes and vice versa [18]. The same thing was also expressed by Syafi'I who had conducted research in 3 different schools stating that the contribution of motivation to learn mathematics to learning outcomes was 89.4% [19]. Based on these two studies, it becomes a further question regarding the reasons for the Banjar Agung school students who have high motivation, but do not have a positive impact on student learning outcomes and national assessments. The results of interviews with teachers and students obtained information that allows it to be the cause of the problems above. The causal factors are 1) the limited use of appropriate learning models/methods for mathematics; 2) learning mathematics has not yet touched the concept area; and 3) there is no use of teaching aids or learning media.

First, the limited use of appropriate learning models/methods for mathematics. Designing learning models is one of the pedagogical abilities that must be possessed by teachers [20]. Teachers with high pedagogical competence will influence student learning outcomes [21]. However, the Math teacher's pedagogical ability at Banjar Agung school is not maximized because they do not come from an elementary school

educational background. This makes the teacher tend to use the method of drilling questions. Generally, the teacher only explains sample questions and ends with practice questions and homework. The continuous use of similar methods will inhibit student activity because the class depends entirely on the teacher [22]. In this study, pedagogical ability of teacher is very needed to design learning that is holistic, active, and enjoy. Teacher quality has been recognized as one of the most important determinants of educational productivity.

Second, learning mathematics has not been taught based on concepts. The use of the drill method trains students to solve problems technically but does not necessarily make students understand mathematical concepts. Understanding of mathematical concepts is needed as a basis for further understanding of mathematics [23]. Numerical ability is a high-level thinking skill, and it starts with a strong understanding of concepts. The process of improving students' numeracy skills needs to be done since students are in elementary school. Students need to learn basic skills such as counting and solving problems. These basic skills are proxies for the minimal functioning of the education system. Basic skills are taught through procedural methods that require a few visual aids or specially made teaching materials. If the education system cannot ensure that all students master these basic skills, there will likely be structural problems within the education system. Such a system can't equip students with high-level skills [24]

Third, there is no use of teaching aids or learning media. The teacher's busyness as a homeroom teacher makes the teacher not have enough time to prepare mathematics learning media. Though teaching aids will help students understand math concepts better. This is supported by Khotimah and Risan's research regarding a positive relationship between the use of visual aids and learning outcomes. The study showed an increase of 57% due to the use of teaching aids [25]. Learning media is a tool in any form that can be used to support the continuity of learning [26]. The purpose of using learning media is to accommodate the achievement of learning objectives. Therefore, effective learning media is learning media that can bring students to achieve learning goals. Several things that teachers need to pay attention to designing effective learning media; 1) design as simple as possible so that it is easy for students to understand, 2) adapted to the current learning topic, 3) not complicated so as not to confuse students, 4) designed with materials that are easy to get but does not reduce the meaning to be conveyed, 5) the media easy to use by teachers in teaching [27]. Therefore, good teacher abilities are needed in designing and using learning media.

4   Conclusion

Need analysis is an initial process that necessary to do before identifying learning objectives and developing learning models. Need analysis, in detail, can be done through several types of analysis that include audience, situation, issue, and media. Based on analysis of the entire type of analysis, it produces recommendations. The development of an active learning model with a CPA approach is needed to improve

student numeracy skills. The active learning model with the CPA approach is a good combination to improve students' numeracy ability.

5   Acknowledgment

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