Development of Prospective Teacher Student Worksheets Through Interactive Case-Based Learning Model Assisted by Cublend App to Improve Mathematical Literacy Skills

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Abstract: In this 21st century, learners are required to be able to adapt to new challenges so that they can solve problems in the real world. This poses challenges in learning, especially online learning, which will continue to grow. This research aims to produce worksheets for prospective teachers using the Interactive Case-Based Learning (ICBL) model assisted by the Cublend Application and oriented to quality mathematical literacy skills in terms of validity, practicality and effectiveness. The R&D development model consists of initial investigation, design, realization, validation & Revision, implementation, and evaluation. The instruments used were an expert validation questionnaire, a student response questionnaire and a mathematical literacy test. The results showed that: (1). Student worksheets using the ICBL model assisted by Cublend App (ICBL-Cublend App) are declared valid and very feasible to use based on expert assessment with a V coefficient of 0.82 and a percentage of 85.50%; (2). Student worksheets using the ICBL-Cublend App model are classified as practical based on the responses of prospective mathematics teacher students with a percentage of 79% (3). Applying the ICBL-Cublend App model effectively improves mathematical literacy skills and significantly influences prospective mathematics teachers' mathematical literacy skills. This study's results imply that students based on the ICBL-Cublend App model can be used as an alternative learning model in university teacher professional development programs.

Keywords: cublend app, interactive case-based learning model, mathematical complex problem solving, mathematical literacy skills

INTRODUCTION

In the 21st century, learners are required to adapt to new challenges, and skills are one of the solutions to adapting to the new environment. The importance of literacy has been widely expressed by experts such as Akyüz (2014) and Arslan & Yavuz, (2012), who see the importance of literacy as a solution to various problems in the country both in the economic, social, and cultural fields. Literacy is one of the abilities that must be integrated into the learning process, including mathematical literacy. Everyone needs to have mathematical literacy skills to deal with various problems related to work or tasks in real life (Kusumah, 2012; OECD (2013). Mathematical literacy is needed to adapt to innovation (Pugalee & Chamblee, 2000).

The results of the 2021 PISA survey stated that Indonesia ranked 70th with a score of 366 out of 81 countries that participated in this survey (Schleicher, 2022). Although Indonesia's ranking has increased compared to the previous PISA results, the score has decreased. The scores obtained have declined since Indonesia participated in the last three PISA surveys. From 2015, with a score of 386, it decreased in 2018 to 379 and decreased again in 2021. In addition to the PISA results, other studies conducted by Kurniawati et al. (2022), Amelia et al., (2021), Hardiani & Desmayanasari (2022), and Aisyah et al., (2018) show that the mathematical literacy skills of students in Indonesia are at low criteria. The following graph shows the results of Indonesia's PISA score since 2000 (OECD, 2022).

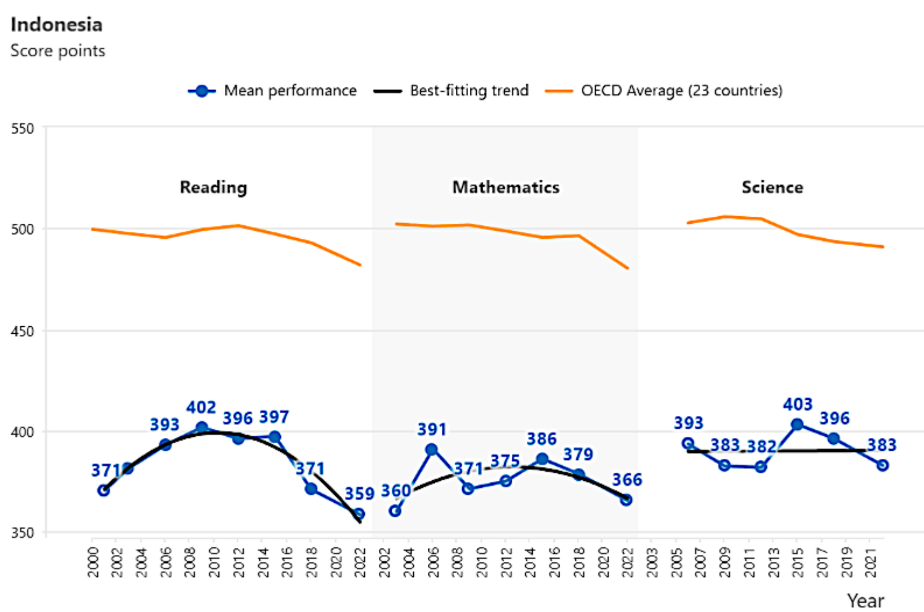


Figure 1: Indonesian Students' Scores in PISA

Educators have a crucial role in the learning process and significantly influence learning success in the classroom (Barlia, 2010). An alternative solution that educators can use to overcome the problem of students' low mathematical literacy skills is the use of the Interactive Case-Based Learning (ICBL) model. This model was developed by adapting the complex problem-solving process model according to Frensch & Funke (1995), Grünig & Kühn (2017), and Chevvalier (2016). Therefore, the ICBL model is defined as learning that is closely related to cases that have characteristics of complex, realistic, and relevant problems with the material being studied where students actively participate in finding various pertinent information to solve the case based on their knowledge and previous experience (Miftah et al., 2024). This model is designed to help students develop higher-order thinking skills, such as mathematical literacy.

In addition, online learning will continue to grow in the future, including in higher education. Online learning allows for developing learning environments that replicate the complexity of real-world problem-solving situations, thus expanding the boundaries of classroom-based learning (Schon, 1987). Furthermore, learners who utilize technology in learning show significantly better communication, complex problem-solving, and creativity (Lai & Hwang, 2014). However, many universities are not ready due to the limitations of existing applications in accommodating the use of constructivism-based learning models. Constructivism-Based Blended Learning (Cublend App) is an application designed to accommodate learning that uses constructivism-based learning models such as the ICBL model. Therefore, it is necessary to develop teaching materials that use the ICBL model assisted by Cublend App (ICBL-Cublend App Model) to improve the mathematical literacy skills of prospective teacher students.

Research Question

Based on the research background and review of relevant research in this study, we sought to answer the following research questions:

1. What is the validity of the learner worksheet using the ICBL-Cublend App model to improve the mathematical literacy skills of prospective teacher students?
2. What is the practicality of the learner worksheet using the ICBL-Cublend App model to improve the mathematical literacy skills of prospective teacher students?
3. What is the effectiveness of the learner worksheets developed using the ICBL-Cublend App model in improving the mathematical literacy skills of prospective teacher students?

Literature Review

Interactive Case-Based Learning Model

Literature related to instructional design around unstructured problem-solving is lacking, especially about how to support students and teachers in instructional design (Choi & Lee, 2009). Therefore, researchers took the initiative to develop a case-based learning model (CBL) by presenting complex cases. CBL is considered more efficient in content knowledge acquisition (Kirschner et al., 2006) and more effective in helping students solve unstructured problems (Williams, 2005). The selection of cases in CBL begins with the search for the issues around students that student may face in the future (Bridges & Hallinger, 1999). Barrows (1986) proposed a taxonomy that classifies problem-based learning (PBL) into two variables, namely self-directedness and problem-structuredness, which was later illustrated by Hung (2011). The following is presented in Figure 2, a modification of the PBL taxonomy according to Barrows (1986).

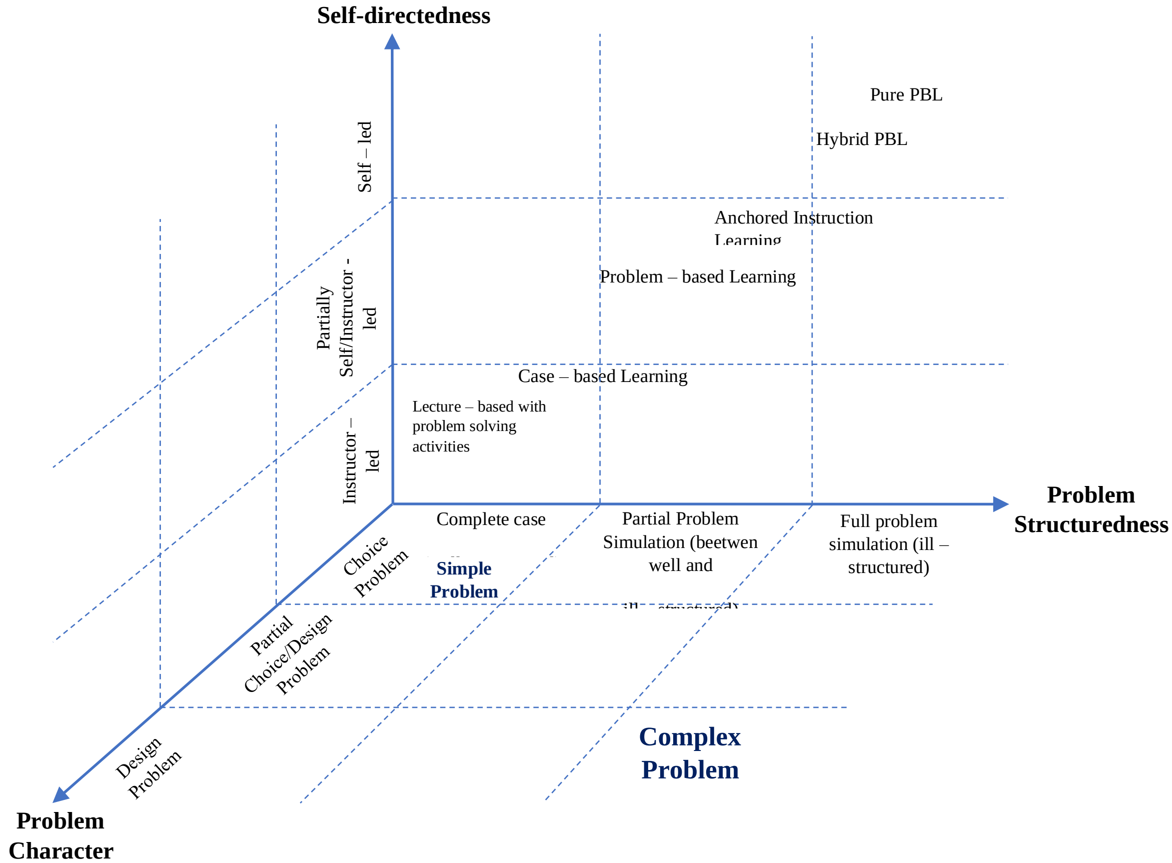


Figure 2: Modified PBL Taxonomy (Miftah et al., 2024)

In solving problems, a person will be influenced by the problem character, which consists of choice and design problems. Choice problems are problems whose solution options are known from the start, while design problems can only be solved by breaking them down into several sub-problems so that the new problem can be solved step by step. There are three possibilities for a problem to be a design problem, namely when the problem can only be solved by: (1). Series, when the problem is broken down into several sub-problems, and one of the sub-problems is solved first, followed by solving the next sub-problem; (2). Parallel, when the problem is broken down into several independent sub-problems, the solution results from coordinating the solutions of several sub-problems; (3). Combined Series-Parallel, when the problem is solved in both Series and parallel ways (Miftah et al., 2024).

The term "interactive" is used for a complex case, such as the one presented in the learning. Therefore, this is called the Interactive Case-Based Learning (ICBL) model. The ICBL model is learning closely related to cases with complex, realistic, and relevant problems with the material being studied, where students actively find pertinent information to solve the case based on their knowledge and previous experience. The learning steps of the ICBL model were developed from CBL learning according to Williams (2005) so that it becomes (1). Dividing learners heterogeneously into several groups; (2). Presenting an interactive (complex) case; (3). Determine objectives based on a review of the complex problem; (4). Diagnosing the issue; (5). Creating a solution.

Constructivism-Based Blended Learning Application (Cubelnd App)

The utilization of technology in learning has been proven to significantly improve better problem-solving skills (Lai & Hwang, 2014). Many LMS have been developed and applied in learning, such as Google Classroom, moodle, and Schoology. However, the LMS has not specifically accommodated the learning process based on constructivism, especially in monitoring and organizing activities at each learning stage (syntax). Therefore, an LMS that accommodates the implementation of constructivism-based learning has been developed, named "Cublend," which stands for constructivism-based blended learning.

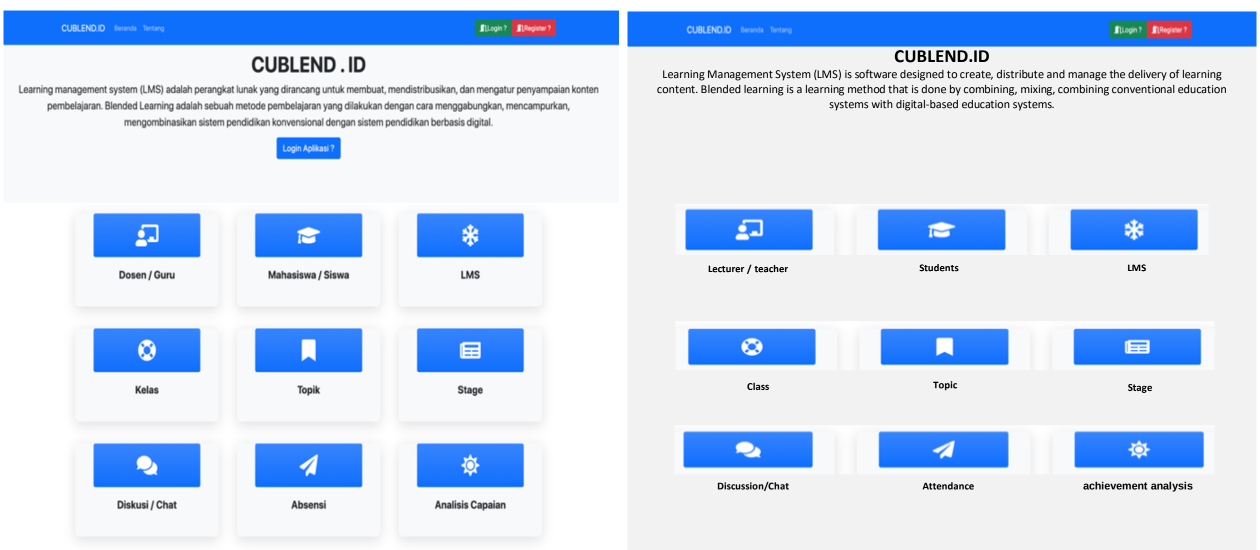


Figure 3: Cublend App Homepage

The learning theory underlying the development of the Cublend App is constructivism. Constructivism requires students to build their knowledge through a thinking process based on objects, experiences, environment, and student activeness. The Cublend App can be used in all lessons using a constructivism-based learning approach. In the Cublend App, educators are free to design learning based on the syntax of the learning approach and can monitor students' responses to each learning stage. Cublend App allows educators and students to discuss things to make learning livelier and more meaningful.

Mathematical Literacy Skills

Mathematical literacy is defined differently in different countries around the world. Some refer to it as quantitative or mathematical literacy, or it can be called numeracy (Rosa & Orey, 2015). Mathematical literacy is the power to use mathematical thinking in problem-solving, reasoning, communicating, and explaining in solving everyday problems to be better prepared for life's challenges (Stacey & Tuner, 2015). Mathematical literacy is an individual's capacity to formulate, use, and interpret mathematics in various contexts (OECD, 2013). Internationally, a person can be called mathematically literate if they can apply mathematics to practical problems that are part of their daily life routine and arrive at a solution (Botha & Putten, 2018).

The indicators of mathematical literacy skills developed in this study are: (1). Formulate identifies opportunities to use mathematics and develop mathematical structures in contextual problems; (2). Employers can apply mathematical concepts, facts, procedures, and mathematical reasoning to solve mathematical problems and obtain systematic conclusions (3). Interpret can reflect on mathematical solutions in the form of conclusions and interpret them in everyday life.

METHOD

This research is a Research and Development (R&D) study. According to Borg & Gall (2003), R&D is an industry-based development model where research results are used to design new products and procedures, which are systematically tested, evaluated, and refined until they meet the criteria of effectiveness and quality. The product of this research is teaching materials that use the ICBL model assisted by the Cublend application. This application is built using the PHP programming language and uses MySQL as a Data Base Management System.

Developing teaching materials using the ICBL model uses the following learning stages: (1). Dividing students heterogeneously into several groups; (2). Presenting an interactive (complex) case; (3). Determining objectives based on a review of the complex problem; (4). Diagnosing the problem; (5). Creating a solution. The instruments used in this research are an expert validation questionnaire, a student response questionnaire, and a mathematical literacy ability test. According to PISA (Thomson, 2013), the indicators of mathematical literacy skills used are formulate, employ, and interpret. The development model used is the model of Plomp (1997) combined with models from Joyce & Weil (2004), Nieveen (1999) and Dick & Carey (2005).

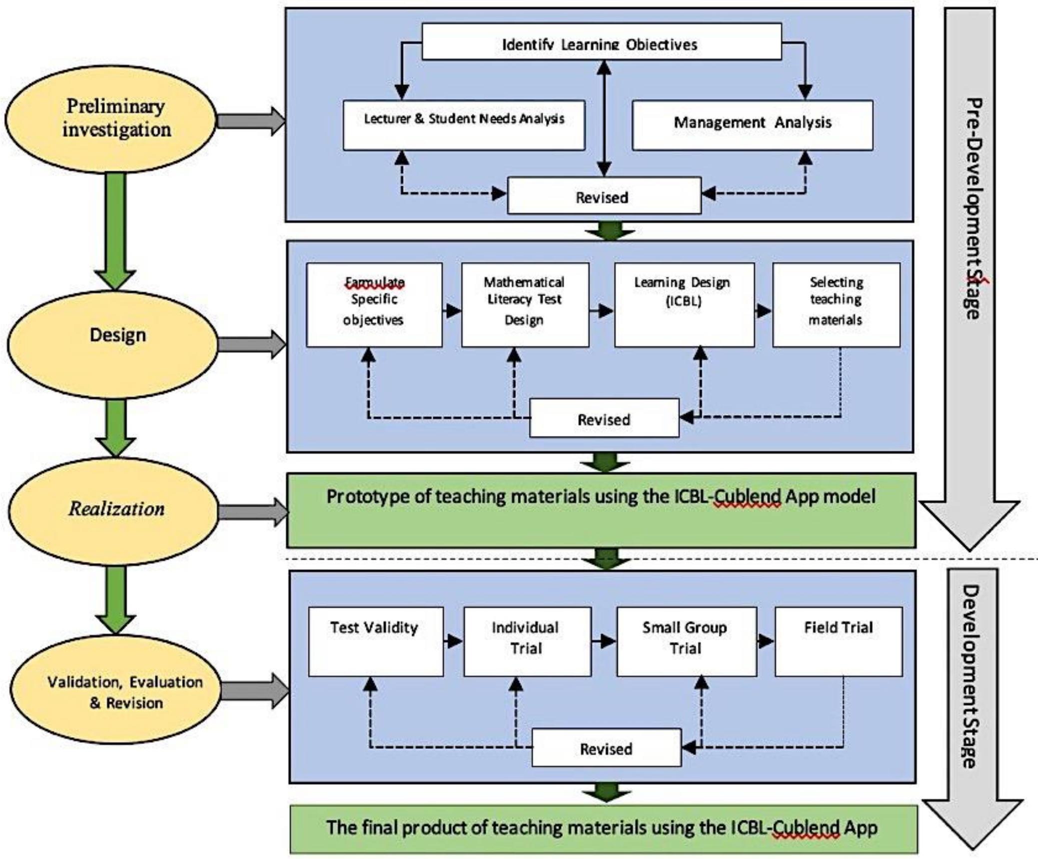


Figure 4: R&D development model

The development stages used in this study are:

(1) Preliminary investigation, which consists of analyzing student needs, the lecturer needs, and learning management;

(2) Design, consisting of formulating specific objectives and evaluation tools, determining learning strategies, and selecting learning materials;

(3) Realization, in the form of prototype realization of model guidelines, learning tools, and instruments;

(4) Validation & Revision. Validation by at least three experts, namely information technology/e-learning and mathematics learning design experts. The validity test is obtained from the average calculation and inter-rater test using the Cohen Kappa formula with the assessment criteria based on Murti (1997), namely if more than or equal to 0.75, then it is categorized as very good if between 0.4 to 0.75 is classified as good and if less than 0.4 is classified as poor. This application is valid if it obtains a minimum value of 3 and a minimum kappa value of 0.4. The practicality test was carried out by distributing Likert scale questionnaires converted to a ratio scale. Table 1 is the eligibility criteria used.

No	Percentage (%)	Criteria
1	81 – 100	Very Decent
2	61 – 80	Worth
3	41 – 60	Decent Enough
4	21 – 40	Not Feasible
5	0 – 20	Very inappropriate

Table 1: Eligibility criteria

(5) Implementation: this stage is carried out to see the effectiveness of applying the ICBL-Cublend App model in mathematics learning to improve the mathematical literacy skills of prospective teacher students. The mathematics learning was carried out on prospective teacher students at the mathematics education department of UIN Syarif Hidayatullah Jakarta in semester II of the 2023/2024 academic year.

(6) Evaluation. One-to-one evaluation where researchers provide opportunities for educators to use LKPD with the ICBL-Cublend App model in learning mathematics as a basis for seeing the effectiveness of this LKPD seen from student activities, student responses and the results of improving students' mathematical literacy skills obtained through pretests and post-tests.

RESULT

Preliminary Investigation Stage

At this stage, a content analysis was carried out as a literature review of previous studies on developing teaching materials, the ICBL model, and mathematical literacy skills. In addition, the curriculum and teaching materials used in the classroom are analyzed, and it was found that the curriculum uses the KKNI-based curriculum. The material analysis results showed that the material of rows and Series is taught in high school mathematics courses in the last material. The materials taught are arithmetic sequence, geometric sequence, and geometric sequence.

Design Stage

At this stage, the design of teaching materials in the form of Learner Worksheets (LKPD) using the ICBL model on the material of rows and Series consisting of five LKPDs according to the material that has been determined. Five LKPDs were developed, and two LKPDs whose learning is designed using the Cublend App, namely on the LKPD of arithmetic sequence material and the LKPD of geometric sequence material. The following displays the Cublend App when presenting complex cases on arithmetic sequence material.

Realization Stage

At this stage, the teaching materials developed are in the form of prototypes complete with learning tools and test instruments for mathematical literacy skills of prospective teacher students according to the indicators of mathematical literacy skills, namely formulate, employ, and interpret according to the material of rows and Series.

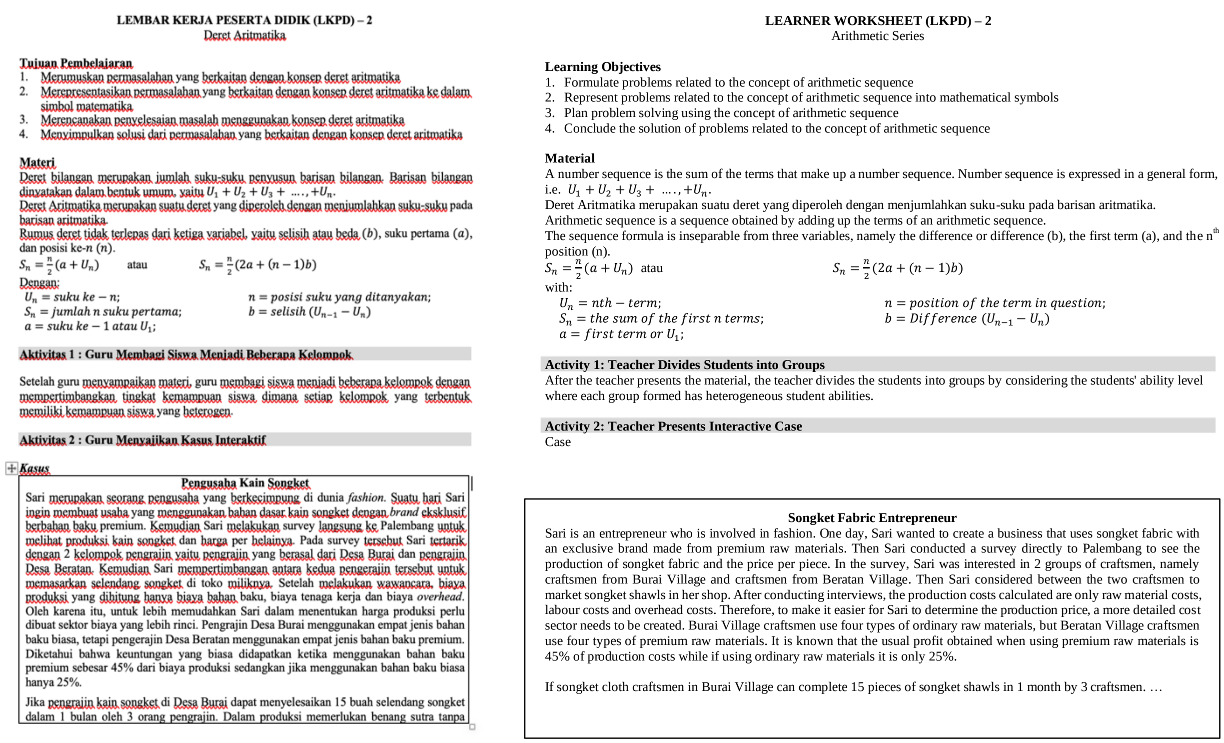
Validation and Revision Stage

At this stage, the teaching materials that have been developed are validated by experts, namely material experts, media experts, and practitioners (lecturers). Table 2 is the recapitulation of LKPD assessment results by experts using the ICBl-Cublend App model.

No	Aspect	Percentage	V	Conclusion
1	Supporting Theory	84	0,81	Very Appropriate, Valid
2	Anatomy and Purpose	84	0,80	Very Appropriate, Valid
3	Semester Learning Plan	84	0,80	Very Appropriate, Valid
4	Format and Display	89	0,86	Very Appropriate, Valid
5	Contents	87	0,83	Very Appropriate, Valid
6	Language	85	0,82	Very Appropriate, Valid
	Total	85,50	0,82	Very Appropriate, Valid

Table 2: Assessment results of prototype teaching materials using the icbl model - cublend

The assessment of the mathematical literacy test instrument was prepared to determine the suitability of each item with the indicators of mathematical literacy skills used. Based on 6 items tested using the Aiken method, 5 items were valid, and 1 item needed to be corrected. After the experts assessed the LKPD and mathematical literacy test instruments, several suggestions and inputs were obtained as improvement materials to improve the product before it was implemented in the test subjects. Some improvements to the LKPD are as follows.



LEMBAR KERJA PESERTA DIDIK (LKPD) – 2
Deret Aritmatika

Tujuan Pembelajaran
1. Merumuskan permasalahan yang berkaitan dengan konsep deret aritmatika
2. Merepresentasikan permasalahan yang berkaitan dengan konsep deret aritmatika ke dalam simbol matematika
3. Merencanakan penyelesaian masalah menggunakan konsep deret aritmatika
4. Menyimpulkan solusi dari permasalahan yang berkaitan dengan konsep deret aritmatika

Materi
Deret bilangan merupakan jumlah suku-suku penyusun barisan bilangan. Barisan bilangan dinyatakan dalam bentuk umum, yaitu $U_1 + U_2 + U_3 + \ldots, +U_n$.
Deret Aritmatika merupakan suatu deret yang diperoleh dengan menjumlahkan suku-suku pada barisan aritmatika.
Rumus deret tidak terlepas dari ketiga variabel, yaitu selisih atau beda (b), suku pertama (a), dan posisi ke-n (n).
$S_n = \frac{n}{2}(a + U_n)$ atau $S_n = \frac{n}{2}(2a + (n-1)b)$
Dengan:
$U_n = suku\ ke - n;$ $n = posisi\ suku\ yang\ ditanyakan;$
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Aktivitas 1 : Guru Membagi Siswa Menjadi Beberapa Kelompok

Setelah guru menyampaikan materi, guru membagi siswa menjadi beberapa kelompok dengan mempertimbangkan tingkat kemampuan siswa dimana setiap kelompok yang terbentuk memiliki kemampuan siswa yang heterogen.

Aktivitas 2 : Guru Menyajikan Kasus Interaktif

Kasus

Pengusaha Kain Songket
Sari merupakan seorang pengusaha yang berkecimpung di dunia *fashion*. Suatu hari Sari ingin membuat usaha yang menggunakan bahan dasar kain songket dengan *brand* eksklusif berbahan baku premium. Kemudian Sari melakukan survey langsung ke Palembang untuk melihat produksi kain songket dan harga per helainya. Pada survey tersebut Sari tertarik dengan 2 kelompok pengrajin yaitu pengrajin yang berasal dari Desa Burai dan pengrajin Desa Beratan. Kemudian Sari mempertimbangan antara kedua pengerajin tersebut untuk memasarkan selendang songket di toko miliknya. Setelah melakukan wawancara, biaya produksi yang dihitung hanya biaya bahan baku, biaya tenaga kerja dan biaya *overhead*. Oleh karena itu, untuk lebih memudahkan Sari dalam menentukan harga produksi perlu dibuat sektor biaya yang lebih rinci. Pengrajin Desa Burai menggunakan empat jenis bahan baku biasa, tetapi pengerajin Desa Beratan menggunakan empat jenis bahan baku premium. Diketahui bahwa keuntungan yang biasa didapatkan ketika menggunakan bahan baku premium sebesar 45% dari biaya produksi sedangkan jika menggunakan bahan baku biasa hanya 25%.

Jika pengrajin kain songket di Desa Burai dapat menyelesaikan 15 buah selendang songket dalam 1 bulan oleh 3 orang pengrajin. Dalam produksi memerlukan benang sutra tanpa

LEARNER WORKSHEET (LKPD) – 2
Arithmetic Series

Learning Objectives
1. Formulate problems related to the concept of arithmetic sequence
2. Represent problems related to the concept of arithmetic sequence into mathematical symbols
3. Plan problem solving using the concept of arithmetic sequence
4. Conclude the solution of problems related to the concept of arithmetic sequence

Material
A number sequence is the sum of the terms that make up a number sequence. Number sequence is expressed in a general form, i.e. $U_1 + U_2 + U_3 + \ldots, +U_n$.
Deret Aritmatika merupakan suatu deret yang diperoleh dengan menjumlahkan suku-suku pada barisan aritmatika.
Arithmetic sequence is a sequence obtained by adding up the terms of an arithmetic sequence.
The sequence formula is inseparable from three variables, namely the difference or difference (b), the first term (a), and the n[th] position (n).
$S_n = \frac{n}{2}(a + U_n)$ atau $S_n = \frac{n}{2}(2a + (n-1)b)$
with:
$U_n = nth - term;$ $n = position\ of\ the\ term\ in\ question;$
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$a = first\ term\ or\ U_1;$

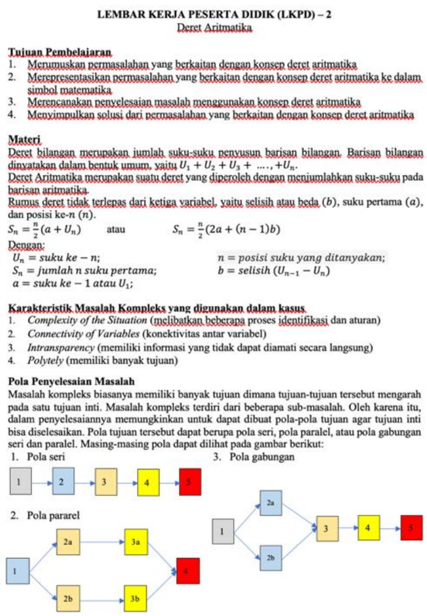
Activity 1: Teacher Divides Students into Groups
After the teacher presents the material, the teacher divides the students into groups by considering the students' ability level where each group formed has heterogeneous student abilities.

Activity 2: Teacher Presents Interactive Case
Case

Songket Fabric Entrepreneur
Sari is an entrepreneur who is involved in fashion. One day, Sari wanted to create a business that uses songket fabric with an exclusive brand made from premium raw materials. Then Sari conducted a survey directly to Palembang to see the production of songket fabric and the price per piece. In the survey, Sari was interested in 2 groups of craftsmen, namely craftsmen from Burai Village and craftsmen from Beratan Village. Then Sari considered between the two craftsmen to market songket shawls in her shop. After conducting interviews, the production costs calculated are only raw material costs, labour costs and overhead costs. Therefore, to make it easier for Sari to determine the production price, a more detailed cost sector needs to be created. Burai Village craftsmen use four types of ordinary raw materials, but Beratan Village craftsmen use four types of premium raw materials. It is known that the usual profit obtained when using premium raw materials is 45% of production costs while if using ordinary raw materials it is only 25%.

If songket cloth craftsmen in Burai Village can complete 15 pieces of songket shawls in 1 month by 3 craftsmen. …

(a)



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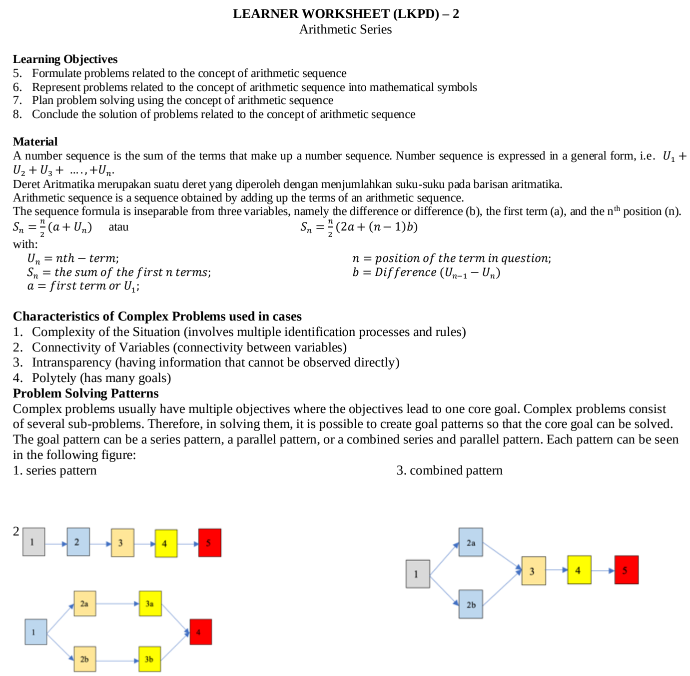
Karakteristik Masalah Kompleks yang digunakan dalam kasus
1. *Complexity of the Situation* (melibatkan beberapa proses identifikasi dan aturan)
2. *Connectivity of Variables* (konektivitas antar variabel)
3. *Intransparency* (memiliki informasi yang tidak dapat diamati secara langsung)
4. *Polytely* (memiliki banyak tujuan)

Pola Penyelesaian Masalah
Masalah kompleks biasanya memiliki banyak tujuan dimana tujuan-tujuan tersebut mengarah pada satu tujuan inti. Masalah kompleks terdiri dari beberapa sub-masalah. Oleh karena itu, dalam penyelesaiannya memungkinkan untuk dapat dibuat pola-pola tujuan agar tujuan inti bisa diselesaikan. Pola tujuan tersebut dapat berupa pola seri, pola paralel, atau pola gabungan seri dan paralel. Masing-masing pola dapat dilihat pada gambar berikut:
1. Pola seri
2. Pola pararel
3. Pola gabungan



LEARNER WORKSHEET (LKPD) – 2
Arithmetic Series

Learning Objectives
5. Formulate problems related to the concept of arithmetic sequence
6. Represent problems related to the concept of arithmetic sequence into mathematical symbols
7. Plan problem solving using the concept of arithmetic sequence
8. Conclude the solution of problems related to the concept of arithmetic sequence

Material
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Characteristics of Complex Problems used in cases
1. Complexity of the Situation (involves multiple identification processes and rules)
2. Connectivity of Variables (connectivity between variables)
3. Intransparency (having information that cannot be observed directly)
4. Polytely (has many goals)

Problem Solving Patterns
Complex problems usually have multiple objectives where the objectives lead to one core goal. Complex problems consist of several sub-problems. Therefore, in solving them, it is possible to create goal patterns so that the core goal can be solved. The goal pattern can be a series pattern, a parallel pattern, or a combined series and parallel pattern. Each pattern can be seen in the following figure:
1. series pattern
3. combined pattern
2

(b)

Figure 5: Before (a) and After Revision (b) of LKPD-2

In Figure 5, the results of expert validation of LKPD-2 on arithmetic sequence material can be seen. Figure 5(a) is the initial design for LKPD-2. Figure 5(b) is the result of revisions according to expert input related to the characteristics of complex problems that must be presented in LKPD and the presentation of possible problem-solving patterns (cases) so that students do not experience difficulties in learning arithmetic sequence material using the ICBL learning model. Some suggestions related to the use of the Cublend application include a less attractive screen display, monotonous writing, discussion tools that cannot be deleted/edited if you make a comment error, less soft colours, not too striking and dominant red and blue colors, writing settings that are sometimes wrong in beheading words, not normative like when typing in Microsoft Word.

Implementation Stage

At this stage, mathematics learning is carried out on the material of rows and Series using teaching materials made with the ICBL-Cublend App model. After the implementation stage was completed, the results of students' work on the mathematical literacy test instrument were analyzed to determine the effectiveness of teaching materials. The average score of students during the pretest was 20, while during the post-test was 48. To see a significant increase in students' mathematical communication skills, a comparison test was conducted with a paired sample T-test. Based on the statistical test, the p-value <0.05 is 0.000, so that $H0$ is rejected. Therefore, it is concluded that a significant difference exists between students' average mathematical literacy skills before and after applying mathematics learning using the ICBL-Cublend App model. The effect size value is 0.696, more than 0.25, so the effect of teaching materials using the ICBL-

Cublend App model on improving students' mathematical literacy skills is 69.6% and is classified as significant.

Evaluation Stage

After the implementation stage was completed, the results of students' work on the mathematical literacy test instrument were analyzed to determine the effectiveness of the LKPD. LKPD is said to be effective if there is an increase in the average value of students' mathematical literacy skills during the pretest and post-test. Table 3 shows increased students' mathematical literacy skills, so using LKPD is declared effective. The average score of students during the pretest was 20, while during the post-test was 48. Descriptive statistics of students' mathematical literacy scores during the pretest and post-test are presented in Table 3 below.

Statistics	**Pretest**	**Post-test**
Lowest score	4	13
Highest score	50	88
Average	20	48
Median	17	50
Mode	17	71

Table 3: Descriptive statistics of mathematical literacy ability of prospective teacher students

Meanwhile, a paired sample T-test was conducted to see a significant increase in students' mathematical literacy skills. The results are presented in Table 4 below.

Paired Differences										
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of The Difference		t	df	Sig. (2-tailed)	Effect Size
					Lower	Upper				
Pair 1	Post-Test – Pretest	28,33	18,97	3,25	21,70	34,95	8,70	33	0,000	0,696

Table 4: Paired sample t-test result

Based on Table 4, the p-value <0.05 is 0.000, so that H_0 is rejected and H_1 is accepted. Therefore, it is concluded that there is a significant difference in the average student learning outcomes before and after using the LKPD. The effect size value is 0.696> 0.25, and the effect of LKPD on improving students' mathematical literacy skills is 69% and is classified as significant.

Discussion

The research and development process begins by conducting content analysis and prospective teacher students, which includes curriculum analysis, teaching materials, materials, and students' mathematical literacy skills. Case-based learning is a learning approach in mathematics education that focuses on delivering the curriculum and not on what is taught (Talmage & Hart, 1977).

Therefore, this research was conducted to produce LKPD products that use the ICBL-Cublend App model and test instruments for students' mathematical literacy skills. The material used is row and sequence material. The product design process starts with designing the prototype of LKPD, mathematical literacy test instruments, and product assessment instruments for validators and trial subjects. After the product was created, it was validated and improved according to the suggestions of the validator. The product was tested and responded to by students who became test subjects. In determining the quality of the LKPD with the ICBL-Cubelnd App model, the criteria according to Nieveen (1999) are used. Namely, the development product is said to be of good quality if it meets the valid, effective, and practical requirements.

Validity Analysis

The validity of the LKPD is based on the expert's assessment. Based on Table 2, a percentage of 85.50 and a V coefficient of 0.82 were obtained. This means that LKPD with the ICBL-Cublend App model is feasible and valid regarding content. This is in accordance with the research of Fauzia et al. (2021), which states that case-based learning teaching materials on statistics material are suitable for support for learning mathematics at school. Likewise, research by Kamaruddin et al., (2021) using the 4D development model resulted in the case-based learning e-learning prototype being developed into a complete mathematics learning media. As for the validity of the mathematical literacy test instrument, 5 valid items were obtained, and 1 item needed to be revised. The question that needs to be revised contains an indicator of explaining why mathematical results or conclusions make sense or do not make sense, related to the context of the problem given. Furthermore, improvements were made to the test instrument in accordance with the suggestions and comments from the expert.

Practicality Analysis

The practicality of teaching materials is based on the prospective teacher-student response questionnaire results to the LKPD with the ICBL-Cublend App model. It was obtained that students responded to the LKPD with the ICBL-Cublend App model, with a total percentage of 79%. Students responded well by saying that the developed LKPD could be easily understood, which helped them solve the problem of rows and Series. Thus, it is concluded that the LKPD with the ICBL-Cublend App model is considered practical and can be used by lecturers and prospective mathematics teacher students, especially on the material of rows and Series. The following is one of the results of student work in the learning process using LKPD on arithmetic series material, especially when determining the solution relationship between objectives. In Figure 6, it can be seen that students can evaluate various objectives related to the main solution of the learning case given.

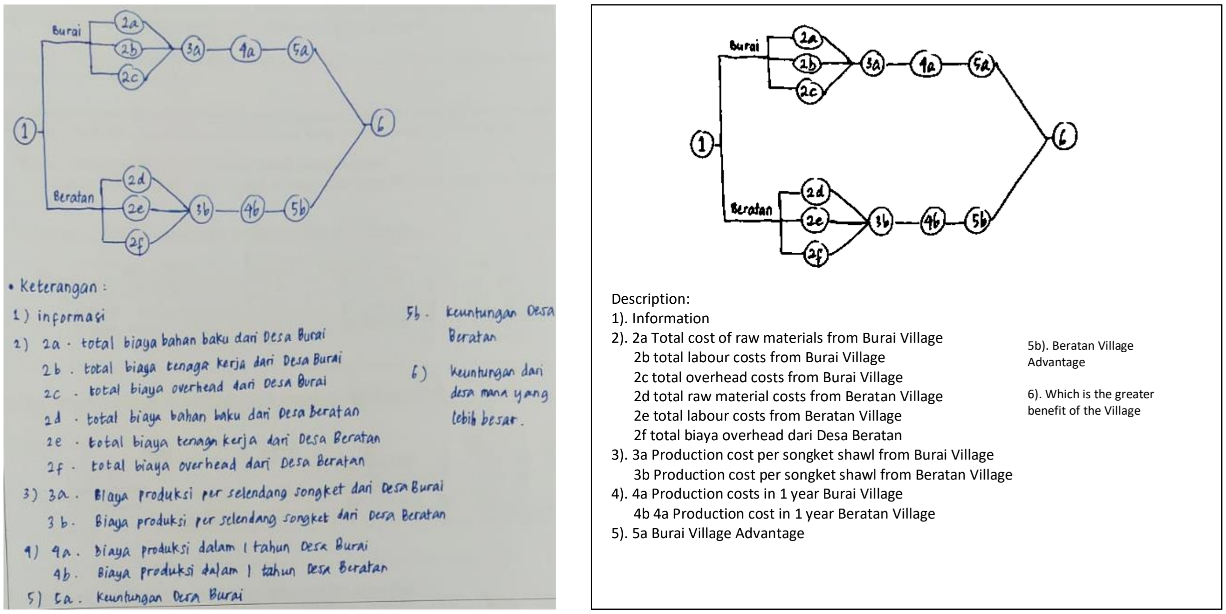
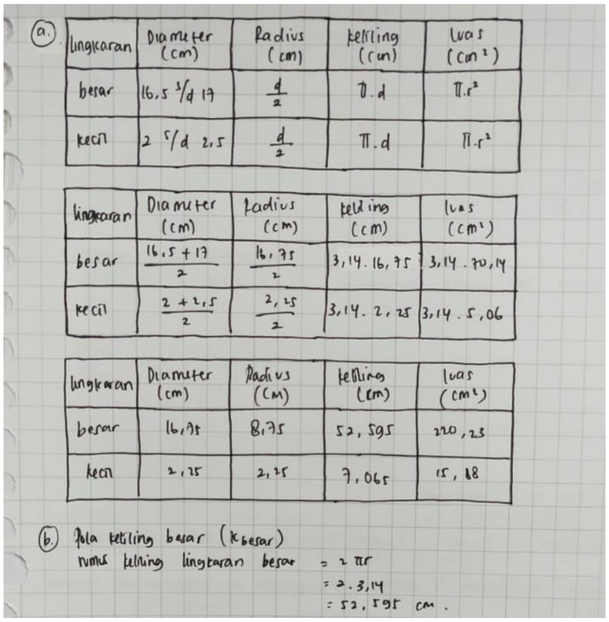


Figure 6: The results of student entries in making case settlement patterns

Effectiveness Analysis

The effectiveness of LKPD using the ICBL-Cublend App model is based on the difference in the average pretest and post-test results of prospective teacher students' mathematical literacy ability instrument. The increase in the average score of students before and after using teaching materials with the ICBL-Cublend App model was 28. The increase was proven significant based on the results of the paired sample t-test. In addition, based on the effect size coefficient of 69.6%, it demonstrates that the developed LKPD has a significant effect on improving students' mathematical literacy skills. Thus, it is concluded that LKPD with the ICBL-Cublend App model effectively improves mathematical literacy skills. The role of technology in learning shows high efficiency in improving students' mathematical literacy (Smirnov et al., 2021). The following presents the results of student work during the post-test related to students' ability to represent problem situations mathematically using tables as one of the indicators of the formulating ability of mathematical literacy.



(a.)

Lingkaran	Diameter (cm)	Radius (cm)	Keliling (cm)	Luas (cm^2)
besar	16,5 s/d 17	$\frac{d}{2}$	$\pi.d$	$\pi.r^2$
kecil	2 s/d 2,5	$\frac{d}{2}$	$\pi.d$	$\pi.r^2$

lingkaran	Diameter (cm)	Radius (cm)	keliling (cm)	luas (cm^2)
besar	$\frac{16,5+17}{2}$	$\frac{16,75}{2}$	3,14 . 16,75	3,14 . 70,14
kecil	$\frac{2+2,5}{2}$	$\frac{2,25}{2}$	3,14 . 2,25	3,14 . 5,06

lingkaran	Diameter (cm)	Radius (cm)	keliling (cm)	luas (cm^2)
besar	16,75	8,75	52,595	220,23
kecil	2,25	2,25	7,065	15,88

(b.) Pola keliling besar (Kbesar)
rumus keliling lingkaran besar $= 2\pi r$
$= 2 . 3,14$
$= 52,595$ cm.

Circle	Diameter (cm)	Radius (cm)	Circumference (cm)	Area (cm^2)
Big	16,5 to 17	$\frac{d}{2}$	$\pi.d$	$\pi.r^2$
Small	2 to 2,5		$\pi.d$	$\pi.r^2$

Circle	Diameter (cm)	Radius (cm)	Circumference (cm)	Area (cm^2)
Big	$\frac{16,5 + 17}{2}$	$\frac{16,75}{2}$	$3,14 \times 16,75$	$3,14 \times 70,14$
Small	$\frac{2 + 2,5}{2}$	$\frac{2,25}{2}$	$3,14 \times 2,25$	$3,14 \times 5,06$

Circle	Diameter (cm)	Radius (cm)	Circumference (cm)	Area (cm^2)
Big	16,75	8,75	52,595	220,23
Small	2,25	2,25	7,065	15,88

b). Large circumference pattern (Kbesar)
Formula for circumference of a great circle $= 2\pi r$
$= 2 \times 3,14$
$= 52,595$ cm

Figure 7: One of the results of student answers on the formulate indicator

In Figure 7, it can be seen that students can understand the problem presented by calculating in detail the circumference and area of the large circle and the circumference and area of the small circle of the Talempong musical instrument. This did not happen when students worked on pretest questions. At the time of the pretest, students could not accurately represent the problem given. This illustrates that student teachers, after learning with LKPD using the ICBL-Cublend App, students' mathematical literacy skills increase.

This study has several limitations, including: (1). Variations in implementing the ICBL-Cubpend App between different teachers and institutions may lead to inconsistencies in the results; (2). Limited access to technology skills among learners may be an obstacle to optimizing the ICBL-Cubpend App model to improve mathematical literacy skills; (3). The study's relatively short duration may not be sufficient to capture the long-term impact of using this model on the mathematical literacy skills of student teachers.

CONCLUSION

The results showed that teaching materials using the ICBL-Cublend App model were declared valid and feasible for mathematics learning. Learning mathematics using the ICBL-Cublend App model effectively improves mathematical literacy skills and significantly influences mathematical literacy skills. The use of teaching materials using the ICBL-Cublend App model is classified as practical based on the responses of prospective mathematics teacher students. Students of prospective mathematics teachers generally stated that learning mathematics using the ICBL-Cublend App model was interesting, that the material taught was easy to understand, and could help improve mathematical literacy skills.

Using the Cublend application to learn mathematics has been proven effective in improving mathematical literacy skills. Therefore, this research contributes to the development of teaching materials in the form of student worksheets that are more interactive and contextual. The worksheets developed using the ICBL-Cublend App model can attract prospective teacher students' interest in mathematics. This study showed a significant increase in the mathematical literacy skills of prospective mathematics teachers. The results of this study imply that LKS based on the ICBL-Cublend App model can be used as an alternative learning model in higher education. In addition, the results of this study can also be used as material in teacher professional development programs.

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