Developing integrated creative problem solving (CPS) textbook for logic and set

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Abstract. The purpose of this study was to develop teaching materials for logic and sets programs that integrated 6 (six) KKNI assignments based on the Creative Problem Solving Model (CPS), and to know the quality of merge teaching set and logic programs 6 (six) KKNI tasks developed through the CPS model. This type of research is Developmental Research. In this study using a 4-D development model (Define, Design, Develop, Disseminate). The subjects in this study were students of the first semester of FMIPA DIK-C-2018 Mathematics education class at the State Universitas Negeri Medan at 36 students. Data processing tools and techniques used in this study are data analysis and expert validation and student response questionnaires. The results of this study are teaching materials in the form of textbooks and Student Worksheets (LKM). These teaching materials have met the requirements and standards of feasibility for experts, design experts, and media, various elements that allow you to attract attention and be easily understood and can we made at a later stage.

1. Introduction
Curriculum change is a natural process that occurs and indeed should occur. The development of science and technology, the needs of the community, the progress of the times, and new government policies have caused the curriculum to change. Life in the XXI century calls for a fundamental change in the higher education system. The forms of these changes are: (i) changes from the viewpoint of the life of the local community to the global (global) community, (ii) the shift from social cohesion to democratic participation, especially in education and citizenship practices [1]. Related to these changes, Prof. Dr. Syawal Gultom as chancellor of Medan State University issued a decree letter from the Chancellor of Medan State University with No. 065 / UN33 / Kep / 2016 [2]. In the decree mentioned, the semester lecture plan is set and developed by the lecturer independently or together in the expert group of a field of science and technology in the study program. The design of the KKNI curriculum curriculum standard will be a reference for all lecturers in designing, implementing and evaluating the lecture process carried out in class. Advanced campuses must have lecture standards, even though they are given the authority of the lecturers to arrange according to the characteristics of their respective studies. If there are standards for planning, implementation, and evaluation, the lecturer can only develop it to implement in the lecture. Referring to the decision of the Chancellor of Medan State University, student competency will be fostered through 6 tasks, namely; Routine Tasks (TR), Critical Book Review (CBR), Journal Review (JR), Mini research (MR), Engineering Ideas (RI), and Projects (PR).
The demands of 6 (six) KKNI curriculum tasks are: (1) Routine Tasks (TR), is the duty of students to fill out Student Worksheets (LKM) at the beginning of each lesson which is the results of literacy material to be discussed. (2) Critical Book Review (CBR), is an individual task that examines two or more books "Set and Logic" which aims to summarize the contents and compare the contents of the book, and students must be able to provide constructive suggestions for improving the book. (3) Journal Review (JR), an assignment that is individual and group in nature that aims to summarize the contents and compare with two or more other relevant journals in the field of "Sets and Logic." (4) Mini Research (MR), is simple research that consists of at least hypothesis questions, main objectives, theories, instruments, data collection, data analysis, and conclusions. (5) Engineering Ideas (RI), the task of engineering ideas is a task in the form of ideas arranged in the form of innovative work ideas in the "Set and Logic" subject areas. (6) Project (PR) The task of this project requires students to be able to transfer the knowledge learned in authentic problem-solving in various fields of science through the investigation of ideas and questions, inquiry processes, critical and creative thinking processes. The task of this project requires students to be able to make innovative and creative teaching aids related to "Set and Logic" teaching material [2].

One way that can be used to implement the KKNI is to improve the quality of human resources through lectures at the university level. Improving the quality of human resources is done by developing a learning device in the form of teaching materials. Teaching materials that will produce include lecture contracts, Semester Program Plans (RPS), Textbooks, as well as LKM (Student Worksheets) which will later serve as guidelines for students in attending lectures. Teaching materials are guidelines that will direct all lecturer activities in the learning process, as well as the substance of competence that should be taught to students.

The teaching materials used in the set of learning subjects and logic based on the CPS learning model. The learning model was chosen because students are required not only to work on the questions in the form of counts. However, students are expected to be able to reason and understand the methods of proof. Problem-solving is a method that requires individuals to use previously acquired knowledge, skills, and understanding to meet the demands of unfamiliar situations. Students must synthesize what they have learned and apply it to new and different conditions [3].

This is in line with previous research (relevant research) namely [4], saying that the science module developed using the Creative Problem Solving (CPS) learning model was able to improve students' creative thinking in solving problems. The development of the science module researchers used a four-D research method. Meanwhile [5], said that the development of CPS-based LKS on environmental change material and class X waste recycling reviewed from five aspects, namely, issues of identity, appearance aspects, language aspects, material aspects and characteristics of CPS. And the results of the validation obtained an average for all elements of 3.68 which is included in the very feasible category, or in other words; the LKS can be used in learning.

Similar research namely, Development of Learning Devices refers to the Somatic, Auditory, Creative Problem Solving Model, Visualization, Intellectually. In this study produced: 1) learning devices that apply to the SAVI-based CPS learning model covering RPP, learning modules, and worksheets according to expert judgment, in general, are included in the excellent category. 2) student and teacher responses to learning referring to CPS-based learning models SAVI generally shows pleasure in the learning process, a new learning model and has never been used before, and is interested in the appearance of LKS and learning modules. 3) the SAVI-based CPS learning model is effectively used in distance learning in space. From the results of these studies, it can conclude that the development of learning devices is valid, practical, and effective [6].

The Creative Problem Solving (CPS) model is a learning model that focuses on problem-solving skills, which is followed by strengthening creativity [7]. While creativity and Creative Problem Solving (CPS), is essential in the world of education today. These skills are not only necessary for adults but also crucial in preparing students for success in their lives [8]. The learning step of the updated Creative Problem Solving model, called six diamond models, consists of mess finding, fact-finding, problem finding, idea finding, solution finding, and acceptance finding [9-11].
The development of the science of a nation shows how advanced the nation is. The thicker the knowledge a person has, the higher his ability to explore his creative potential. Creative thinking is developed based on experience; school is one of the places where students acquire and build on that knowledge. All countries, both poor countries, developing countries and even developed countries need the ability to develop creative thinking. The low ability of creative thinking will have an impact on the quality of human resources [12].

This teaching material based on the CPS model aims to assist students in carrying out current tasks on the demands of the KKNI curriculum. Semester 1 students (one) are tough to fulfill or work on all 6 (six) KKNI assignments that they must complete in one semester. The transition period from students to students, so that students still have to be partially guided in the overall task. The application of the CPS model emphasizes problem-solving skills to choose and develop responses. Not only by memorizing without thinking, but problem-solving skills also expand the thinking process. Therefore, researchers designed integrated teaching materials with 6 (six) KKNI assignments. Intended, so that students can learn independently and the results of the tasks collected are also optimal.

By getting students to use creative steps in solving problems, they are expected to help students overcome difficulties in learning mathematics. Students faced with a problem; they can do problem-solving skills to choose and develop their responses. CPS is a representation of natural process dimensions, not a forced effort. CPS is a dynamic approach; students become more skilled because students have internal procedures that are more structured from the start. Many activities involve creativity in problem-solving such as document research, observation of the surrounding environment, activities related to science, and creative writing. By applying the CPS model, students can choose and develop their ideas and thoughts.

2. Research Methods
This research is research and development which aims to develop teaching materials that are integrated 6 (six) tasks of the KKNI based on the CPS learning model. The research model used is the development of a 4-D model. The 4-D development model (Four D) is a model for developing learning devices. The 4D development model consists of 4 main stages, namely: 1), Define (Defining), namely in the define stage it includes five main steps: front-end analysis, student analysis (learner analysis), task analysis (task analysis), analysis of concepts (concept analysis) and formulation of learning objectives (specifying instructional objectives). 2), Design (Design), at this stage aims to design learning devices. Four steps must be taken at this stage, namely: criterion-test construction, media selection (media selection) that is in accordance with the material characteristics and learning objectives, format selection (format selection), which examines teaching material formats existing and determine the composition of teaching materials to developed, make the initial design (initial design) according to the form chosen. 3), Develop (Development), at this stage of development is to produce product development which is carried out through two steps, namely: expert appraisal followed by revision, developmental testing. 4), Disseminate (Dissemination) The dissemination process is a final stage of development. The dissemination stage is carried out to promote development products so that they can be accepted by users, both individuals, groups, or systems [13]. The 4-D type research model can be seen in Figure 1 below:
This method and model selected because it aims to produce products in the form of teaching materials. The product developed is then tested for its feasibility by the validity and practicality of the teaching material. This research conducted at the Mathematics Education Study Program, Medan State University (Unimed). The subjects of this study were 36 students of Mathematics Education Study Program class DIK C-2018 FMIPA. The data obtained were analyzed descriptively based on the results of expert validation, education practitioners and peers and the results of the student response questionnaire [14].

3. Discussion
The initial stage of this research is the definition phase. Where at this defining stage are curriculum analysis, student character analysis, and course selection? The results of the curriculum analysis used by students in the first semester of the 2018/2019 academic year at FMIPA Unimed are the KKNI curriculum. In this KKNI curriculum students are required to be able to complete 6 assignments from each subject studied. Teaching materials used do not yet have a component that triggers student activities to analyze the facts, raises curiosity, makes observational and experimental skills and looks for alternative problem solving from various perspectives. Therefore students expect the teaching materials they use to guide students in completing the 6 KKNI assignments.
Then analyzing the character of students, first semester students of mathematics education are early learners (transition from student to student). Where the first-semester students still feel that learning must be done when the lecturer is present in the class. Meanwhile, students are required to be able to complete 6 KKNI assignments in one semester from each course they take. The courses chosen in this research and development are "Set and Logic" courses. The material in this course is no stranger to students because they had already learned the material in this course when they were in high school or equivalent. But the material they learned when they were in high school or equivalent, was only a matter of calculation and in the form of memorization.

Meanwhile, in college, the material in this course is the initial foundation for them to graduate in other mathematics courses. This is because all the material in the mathematics courses from the semester I to semester VIII requires students to be able to carry out evidence methods from each existing theorem. The results of the syllabus and material analysis formulated the objectives of the lecture and the indicators by the competency standards of the set and logic courses.

The second stage is the stage of designing teaching materials by developing dictates and LKM books. The initial design of this book consists of cover, introduction, table of contents, introduction, material description, closing, and bibliography. While the model of the LKM that designed is in the form of practice questions that use the stages in the process through the steps that have been prepared. The reason for choosing the book and LKM media is so that students easily analyze, find information in books, solve problems, draw conclusions about the material set and the logic and application in conducting proof theorems. Then make the initial design which is the first draft (draft 1) which is still a prototype which will then validated to the expert validator.

The third stage is the development stage. The initial product in the form of books and LKM draft II that have been developed then carried out validation. The testing of the draft I gave to 3 Unimed mathematics education lecturers. Criteria for either a book if the validity value is in the range of 4-5 [15]. The recapitulation of the results of the validation is presented in Table 1 below:

| Number | Validator Name                  | Value | Criteria |
|--------|---------------------------------|-------|----------|
| 1      | Development Validator expert    | 4,6   | Valid    |
| 2      | Material expert validator       | 4,2   | Valid    |
| 3      | Material expert validator       | 4,4   | Valid    |
| Average|                                 | 4,4   | Valid    |

Criteria : Valid

Based on the results of the validation of the development experts and material experts, which are listed in table 1, in general, the feasibility of teaching materials developed in the "valid" category. Next data and trial analysis in small groups. This little group test conducted on ten students who had taken the set and logic courses, as the readability test of the teaching materials developed, namely the set and logic books. The following table 2 shows the readability test results of teaching materials.

| Average | Score  | Percentage | Criteria |
|---------|--------|------------|----------|
|         | 42,44  | 84,8       | Good     |
From the data shown in Table 2, it gives an illustration that the teaching materials set, and logic has good readability values or in other words, it can conclude that the book set and logic are easy to understand.

Whereas in the large group referred to here is one class of first-semester mathematics education FMIPA UNIMED which took the set and logic courses, which amounted to 36 students. Data from this large group is to see the practicality and effectiveness of the teaching materials developed, namely the set and logic books.

| Table 3. Data on Practical Material Test Results |
|-----------------------------------------------|
| Score | Percentage | Criteria       |
|-------|------------|----------------|
| 30,14 | 83,74      | Good           |

From Table 3, the practicality test value is seen at 83.74% with reasonable criteria, in other words, set books and functional logic to use.

After the learning activities using CPS-based teaching materials complete, students give a questionnaire sheet containing responses, input, and assessment of the teaching materials. The results of student responses are used to obtain student opinions about the feasibility of integrated CPS-based teaching materials with 6 KKNI assignments that applied in the learning process. The results of the student response questionnaire analysis can see in table 4. Questionnaires were is given to 36 DIK-C 2018 students in Mathematics Education.

| Table 4. Student Response Data |
|--------------------------------|
| Assessment aspect | Happy | Percentage | Not Happy | Percentage |
|--------------------|-------|------------|-----------|------------|
| Average            | 27,3  | 86,88      | 3,8       | 13,02      |

Based on table 4 above, the average overall responding positive is 86.88% while those that respond negatively are 13.02%.

The fourth stage disseminates (spread), at this stage the distribution of teaching materials is carried out to 36 DIK-C 2018 Mathematics Education students at FMIPA Unimed.

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5. Conclusion

Based on the results of research and discussion it can be concluded that the quality of integrated teaching materials 6 (six) KKNI assignments based on the CPS learning model included in the correct category with an average of 4.4. Then the student response states the teaching material is very good or feasible to use, and this based on the student response questionnaire in which 86.88% of students responded positively to the instructional materials developed.
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