The effectiveness of mathematics learning devices using
learning models Interactive Conceptual Instruction (ICI)
for junior high school students

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Abstract. The mandate of the 2013 curriculum states that mathematics subjects aim to make students able to understand concepts. Teachers can plan learning by arranging appropriate learning tools so that students are able to understand the concept. One learning model that emphasizes the concept is the learning model Interactive Conceptual Instruction (ICI). This study aims to determine the effectiveness of mathematics learning tools using the learning model Interactive Conceptual Instruction (ICI). This study uses the ADDIE development model which consists of five stages, namely analysis, design, development, implementation, and evaluation. Field trials were conducted in five meetings in class VII-B of SMPIT Nurul Fikri Boarding School Aceh. In determining the effectiveness of learning tools, this study uses Nieveen's criteria. The development results show that the learning device developed using the Interactive Conceptual Instruction (ICI) is effective. The effectiveness is known based on the test of student learning outcomes with a minimum completeness of 85% and the positive response of students to learning using the ICI model. Thus, the learning device using the ICI model is suitable for use by teachers in learning, especially on social arithmetic material at the junior high school level.

1. Introduction
Understanding the concept is very important to achieve in learning mathematics. The mandate of the 2013 curriculum states that mathematics subjects aim to enable students to understand concepts and apply mathematical procedures in everyday life. In line with that, Zulkardi [1] also stated that mathematics emphasizes concepts. Therefore, teachers are expected to be able to prepare mathematics learning that emphasizes concepts so that students are able to understand mathematical concepts, be able to solve problems, and be able to apply this learning in everyday life.

One way that students are able to understand the concept is by interacting both with the teacher and among their peers. Vygotsky stated that learners can effectively construct their knowledge when they interact with other people who already know or better know or master the knowledge that is being studied [2]. Furthermore, Vygotsky also views that social interaction plays a very important role in the cognitive development of students. At the social level, students interact with their environment so that it has an influence between one student and other students, while at the individual level it will affect the psychological development of students [3]. Thus, interaction has an important role in learning carried out because it
requires students to take an active role in solving problems and students will further develop when interacting with other people so that it has an impact on learning achievement according to what is expected.

Teachers are expected to be able to create a learning atmosphere so that students understand what they are learning. The success of a learning activity is determined by the success in making the learning plan [4]. Before the teacher teaches the teacher is expected to be able to prepare the material to be taught, props / practicum to be used, questions and directions to stimulate students to be active in learning, learn the weaknesses and strengths of students, and learn the preliminary knowledge of students in order to prepare the tools. learning in accordance with the circumstances of students [5]. The learning tools consist of a syllabus, a lesson plan (RPP), student activity sheets (LKPD), evaluation instruments, and learning media [6]. Teachers should be able to innovate to create learning tools in the form of lesson plans, LKPD, learning outcomes tests (THB) that can stimulate students’ understanding of concepts so that the expected learning objectives can be achieved.

Although understanding the concept is very much needed, in reality, students’ understanding of the concept is still not optimal. There are many students who after learning mathematics, are not able to understand even the simplest parts, many concepts are misunderstood so that mathematics is considered a difficult, intricate, and difficult science [7]. Furthermore, there are still many students learning passively, students are generally reluctant to express their opinions or ask questions. Among the various causes, one of which is that teachers do not have the skills or skills to prepare preparation tools for learning, teachers are reluctant to make learning tools [8]. Therefore, teachers must be able to prepare lesson plans properly so that students understand what they are learning so that the learning activities carried out become meaningful. Teachers should also learn about the situations and conditions of learning of students in compiling learning tools such as lesson plans, LKPD, and THB so that students understand the concepts they are learning.

One learning model that emphasizes the concept is the learning model Interactive Conceptual Instruction (ICI). The syntax in the ICI learning model is conceptual focus, classroom interactions, research-based materials, and use of text [9]. Learning carried out with the ICI learning model has emphasized the concept since the beginning of learning by giving problems to students and involving class interactions both interactions with teachers and interactions between fellow students. The ICI learning model includes constructivism-based learning so that students are expected to be able to construct their own knowledge in solving mathematical problems. Students can use assistance in the form of student books or other additional reading provided by the teacher so that students can build understanding of concepts and can correct mistakes that are not correct regarding the problems given.

Several studies on the ICI learning model such as the study of Antara stated that the ICI learning model assisted by semi-concrete media had an effect on mathematics learning outcomes [10]. Furthermore, Apriandi’s research states that the application of-based matlab simulation media interactive conceptual can improve understanding students on the material of linear equation systems [11]. In this study, learning tools were developed that included additional reading that could help students understand concepts. Thus, this study was conducted to determine the effectiveness of learning devices using the ICI learning model.

2. Methods

This research is a development research using the ADDIE development model which consists of five stages, namely analysis, design, development, implementation, and evaluation. This research was conducted at SMP IT Nurul Fikri Boarding School Aceh and the test subjects of this study were conducted on grade VII students. Trials were carried out twice, namely small group trials and large group trials.
The small group trial subjects were selected by six students of class VII-A SMPIT Nurul Fikri Boarding School Aceh. While the field trial subjects were taken class VII-B which consisted of 19 students at SMP IT Nurul Fikri Boarding School Aceh. Field trials were conducted in five meetings consisting of four learning meetings using the ICI learning model and one meeting to test students’ understanding. The instruments used in this study were student response questionnaires and test results of students' understanding of the concept of learning.

The data obtained based on trials were then analyzed and described for each meeting. This study produces learning tools that are valid, practical, and effective following Nieveen's criteria [12]. Learning devices are said to be valid if all validators state they are suitable for use, practical if all validators state that the learning tools developed can be applied in a good category, while learning devices are said to be effective based on the completeness of the learning outcomes test and the positive response of students.

3. Result and Discussion

The development stages consist of five stages, namely analysis, design, development, implementation, and evaluation. The stage is analysis carried out to analyze the products that will be developed according to the needs of students and teachers in order to overcome problems in learning. The instrument analysis consists of an analysis sheet: curriculum, concepts, literature and learning resources, existing learning tools and uses / needs. In the stage design, the researcher designed the learning device using the learning model Interactive Conceptual Instruction (ICI) that was in accordance with the results of the needs analysis in the stage analysis. The development, this stage is the product realization stage.

The instrument used at this stage is a validation sheet for learning devices using the ICI learning model. The learning tools developed were validated by four validators. Learning tools are validated by experts, practitioners, and peers. In the lesson plan, the validator suggested that the apperception section should be longer than the time provided because the apperception stage is the initial stimulus for the material to be studied so that the teacher can know where the students' understanding is, the pictures in the lesson plan are given information to make it easier to use when using it, and quizzes in the closing section it is replaced with test questions to test the ability of students so that the objectives of giving questions can be seen.

In LKPD the validator suggests LKPD 1 regarding profit and loss is adjusted to the competency achievement indicators, LKPD 3 about the tara concept needs to be linked with questions and LKPD 4 regarding the matter of savings interest is better to use cooperative interest. In Additional Reading (Use of Text), the validator suggests the need to use simpler percentage numbers such as integers because it will make it easier for students to understand the concepts given in additional reading.

At THB, the validator suggested that the design of the THB question sheet be made more attractive and suitable for the junior high school level, there needed to be instructions and information on how to work on THB questions, the answer column on THB questions was adjusted to the length of the answer, question number 1 was adjusted to the concept understanding indicator, and question number 4 better to use cooperative interest problem. After the learning device meets the valid and feasible criteria for use, the learning device developed can be tested.

Testing was carried out twice, namely small group trials and field trials. Small group trials were carried out on 6 students of class VII-A consisting of 2 students with high ability criteria, 2 students with moderate ability criteria, and 2 students with low ability criteria. After the learning device is revised based on small group trials, then it can be tested in the field. Field trials were conducted to obtain data on practicality and effectiveness. Practicality can be seen based on comments and suggestions from validators who are valid and the implementation of
learning and observer responses to learning activities carried out are included in the good category [12].

The implementation of field trials which is carried out is supervised by two mathematics teachers who act as observers of the implementation of learning and one friend who acts as an observer of the students' activities. Observers of learning implementation stated that the implementation of learning used the ICI Learning Model with the category Conceptual Focus, Classroom Interaction, Research-based materials, and Use of Text and atmosphere are included in the very good category. Furthermore, the observer also stated that the learning device using the ICI model was applicable and included in the very good category.

The effectiveness of the learning device is seen based on the completeness of the test results of learning the ability to understand concepts and the results of the student response analysis. The learning outcomes of students through the ICI learning model reach completeness. Research conducted by Apriandi states that the application of-based matlab simulation media Interactive Conceptual Instruction can improve understanding students on the material of linear equation systems. Furthermore, Salamah's research also found that through the ICI learning model students can correct misconceptions and achieve completeness of learning outcomes [13]. Thus, learning using the ICI learning model can be applied in the classroom so that students' inappropriate understanding of concepts can be corrected. The following is one of the students' answers to THB.

![Figure 1. Students’ Answers.](image1)

Based on students' answers, it can be seen that students already know what information is obtained from the problem, understand the concept of the purchase price, and are able to solve problems appropriately.

Students also give positive responses to learning devices using the ICI learning model. This is in accordance with Apriandi's research which states that learning using the learning model Interactive Conceptual Instruction (ICI) can provide a positive response [11]. Students also feel happy and find it easier to understand social arithmetic learning using the ICI learning model and hope that learning on other materials can also use ICI-based LKPD. Following are comments or suggestions from students regarding ICI learning tools.

![Figure 2. Comments or Suggestions from Students.](image2)
Students are happy and enthusiastic about learning using the ICI model because it can make it easier for students to understand the concept. Students also hope that learning using the ICI model is often applied in mathematics learning.

4. Conclusion
This study produces mathematics learning tools using the learning model *Interactive Conceptual Instruction* (ICI). The learning device developed has met the valid criteria based on the validator's assessment of the learning device and the feasibility of the trial shows that the learning device is easy to use. The effectiveness of the learning device is seen from the completeness of the students' learning outcomes test and the positive response of students. Thus, it can be concluded that the mathematics learning device using the learning model *Interactive Conceptual Instruction* (ICI) has met the criteria for being effective.

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