Development of Computer Assisted Instruction (CAI) Based Learning Media in Microeconomic Theory Courses in the Management Study Program, Faculty of Economics, Methodist University of Indonesia

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Abstract. Development of Technology have influenced education, it is necessary to develop learning media to meet student needs. The learning media developed is learning media based on Computer Assisted Instruction (CAI). This study aims to determine the feasibility and effectiveness of CAI-based learning media products in the Microeconomics Theory Course. The research method is Research and Development (R&D) which was developed with the ADDIE design (Analysis, Design, Development, Implementation, and Evaluation). The results of development research obtained CAI-based learning media that were very feasible by media experts with an average (3.79), material experts (4.40), and design experts (4.64) as well as field trials on students with an average (4.14) is high. In measuring the level of effectiveness using the N-gain score, namely 0.68 in the medium category. Based on the results of data analysis, this learning media can be used for the learning process.

Keywords: Learning Media, Computer Assisted Instruction (CAI), ADDIE

1 Introduction

Because cooperation and climate are synonymous, learning is a very distinct kind of corporate activity. If an educational programme can help students see the world from a different perspective and can help them recognise that the experiences they have while pursuing an education can directly contribute to their personal growth, then that programme is considered to be running smoothly (Aisyah, 2009).

There is a need to modify the Lectures in Microeconomics Theory procedure. The curriculum's weighting of disciplines can have an impact on how students learn. When the lecture process is organised to be ready for the lecture process, this is felt. In addition to making plans, lecturers also need to consider relevant and helpful innovations that will help the lecture process function smoothly for the upcoming semester, taking into account the conditions and current developments of the student body. The rate of advancement is accelerating, and cultural variations among students can significantly impact how instructors interact with them during lectures and evaluations.

The state of technology advancement is one instance of a phenomenon that lecturers in charge of a course can feel. It is quite simple for lecturers to provide lectures virtually, eliminating the

need for in-person meetings between themselves and their students or even between students and classmates. Because of their heavy reliance on smartphones, students become quickly saturated and extremely bored during class lectures or other learning activities when presented with a highly theoretical debate process. Because of this, lecturers will need to be able to adapt to technology more and more because it will help students learn and enhance their ability to teach. (Budiman, 2017).

From the data it can be seen that there are still many students who get C+ grades, namely 22 people, 32 people get C grades and 15 D grades. Based on the Curriculum Guide for the Management Study Program, Faculty of Economics, Indonesian Methodist University, C+ grades (65-69.99), C grades (56.00 – 64.99) and D grades (45.00 – 55.99). Based on the data obtained, it can be seen that the learning level of students is still relatively low. This shows that students need to improve their learning outcomes.

Many factors can cause non-optimal learning outcomes, especially in microeconomic theory. (1) Lack of lecturer interest to use *software* computers, this problem is also in line with research conducted by (Idris H, et al: 2018). (2) The unavailability of learning media can complicate students' understanding of abstract and conceptual teaching materials so that learning outcomes are not optimal. (3) The absence of learning media also makes the learning process passive and even boring, which further reduces the enthusiasm and motivation to learn. This problem must be addressed immediately so that student learning outcomes can be improved (Sriadhi, 2014).

Media that uses computer-based technology, or computer-aided instruction (CAI), is a method of creating or delivering content using microprocessor-based sources. Essentially, pupils are presented with material via a glass screen in this computer-based learning media programme (Arsyad, 2007). By utilising media When used in conjunction with other instructional strategies, computer-assisted instruction can help students learn in more efficient ways by enhancing their knowledge and abilities, which in turn can lead to better learning outcomes (Wahyuni, S. 2016).

2 Library Study

2.1 Development Model

One of the development models that is used as a reference for researchers is the ADDIE model which has stages that include aspects (1) *analysis* (analysis), (2) *design* (planning), (3) *development* (development), (4) *implementation* (implementation), (5) *evaluation* (assessment) (Aldoobie, N. 2015:72). Even though the development procedure is shortened, it already includes a testing and revision process to ensure that the product being developed meets the product criteria. The development process requires multiple tests by a team of experts, individual research subjects, limited and wide scale (field), and revisions to improve the final product. excellent, scientifically proven, and error-free. The model for creating learning materials on microeconomics theory is shown in the chart below.

2.2 Learning Media

According to Gagne and Briggs (1975) Learning media comprises devices that are used to physically transmit the information found in teaching materials. These include computers, televisions, movies, tape recorders, cassette players, video cameras, and drawings in addition to books. Additionally, media can be defined as anything that can be used to spread ideas and pique students' interests in order to motivate them to participate in the educational process. According to Fleming, who was cited by Azhar Arsyad (2011), Fleming is more likely to assert that the media serves as a mediator and demonstrates this function by effectively managing the relationship between the two key participants in the learning process—students and the lesson content. To put it briefly, the media serves as a conduit for messages in the context of interactions and communication between educators and learners so that they can pique students' interest and support independent learning by stimulating their thoughts, feelings, and concerns..

2.3 *Computer Assisted Instruction* (CAI)

According to Fourie (1999), Computers are used in the interactive instructional technique known as CAI to display educational content and track students' progress. It is also referred to as computer-based training (CBT), computer-assisted learning (CAL), and computer-based education (CBE). With CBT, students are able to guide their own learning. The learning process for CAI learning combines text, graphics, sound, and video. This is particularly helpful for situations involving distance learning. Computer-assisted teaching is becoming more and more popular due to the growth of the internet and the need for distance learning.
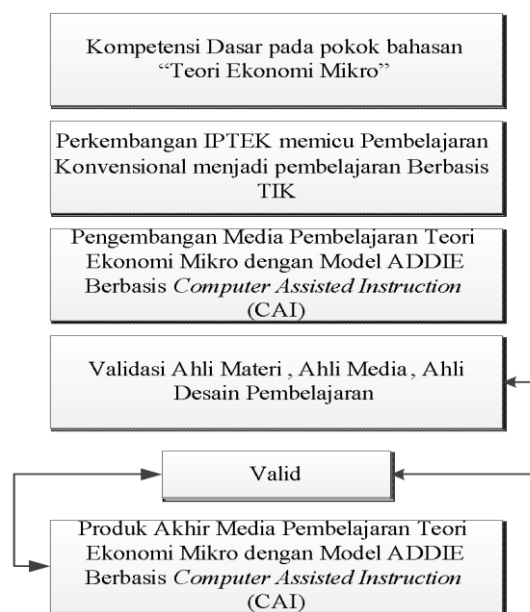
2.4 Conceptual Framework

Fig. 1. Conceptual Framework

3 Research Methods

Implementation This research was conducted at the Management Study Program, Faculty of Economics, Indonesian Methodist University, Jalan Hang Tuah No 8 Medan. The time for conducting this research will be held in March 2023 in the Even Semester of the 2022/2023 Academic Year. The subjects of this study were 2nd semester students, totaling 30 people as subjects for the effectiveness test phase. These criteria are used based on the technique *purposive sampling*. According to Sugiyono (2014) technique *purposive sampling* namely the way of determining the sample based on certain considerations. The object of this research is learning media with models *Computer Assisted Instruction* (CAI) Theory of Microeconomics.

The instruments for this development research were interview guides, questionnaires and learning achievement tests. The interview guide is used to analyze the needs of lecturers and students for semester 2 media. Questionnaire sheets contain statements compiled based on learning media indicators for validating learning media Microeconomic Theory with the Free ADDIE Model *Computer Assisted Instruction* (CAI) developed. Researchers used research instruments in the form of interviews using a number of questionnaires with the aim of analyzing the need for instructional media referring to the needs of semester 2 students.

4 Research Result

4.1 Analysis

The requirements analysis stage of this research and development was carried out by observation at the Indonesian Methodist University's Faculty of Economics. The analysis's

findings will be used as a guide when creating learning materials based on CAI. The findings of the researchers' observations in the classroom indicate that there is still a minimal use of learning media in the teaching and learning process. The learning media that is used in the classroom is Microsoft Office PowerPoint software, which does not pique students' interest in the subject matter. Additionally, the curriculum used at the Indonesian Methodist University's Faculty of Economics is the IQF Curriculum, which mandates that lecturers be able to integrate technology into their lessons. In order to spark students' interest and curiosity about the subject matter being taught, researchers consider creating new learning materials that are more visually appealing.

4.2 Design

The analysis phase is followed by the planning stage. A design sketch is necessary during the design phase in order to create learning media. The storyboard and flowchart are filled in with the sketch. Learning media by using *software macromedia flash* developed by researchers contains 7 *frame* which consists of *frame* home page/main menu, *frame* learning achievement, *frame* instructions for use, *frame* material, *frame* example, *frame* quizzes and *frame* profile.
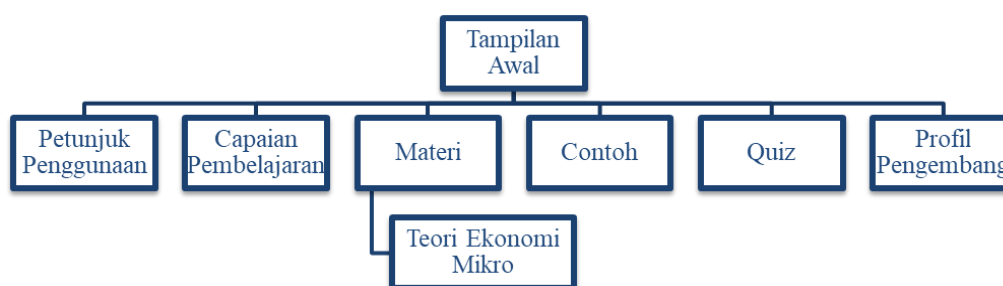

Fig. 2. Plan *Flowchart* Instructional Media

4.3 Development

Making learning media refers to *strory board* which has been made in fig 2. This media is developed by using *software macromedia flash*. The content of this learning media consists of materials obtained from several books on microeconomic theory used by course lecturers.

Following the creation of the learning materials, a validation of the product's viability is done. Expert validators conduct the validation of learning media, requesting both theoretical and practical considerations. Media experts, design experts, and material experts are examples of expert validators..

Table 1. Validation of Media Experts, Design and Material

No.	Expert Validation	Score	Category
1	Members of the Media	3,79	Worth it
2	Design Expert	4,64	Very Worth it
3	Material Expert	4,40	Very Worth it

	RATE-RATE	4,28	Very Worth it
	VALIDATION CATEGORY	SO WORTH IT	

From the table above it can be concluded that the average validation questionnaire answers from Media Experts, Design Experts and Material Experts with an average of 4.28 (Very Eligible) with the Very Feasible category to be used in learning microeconomics theory courses.

4.4 Implementation

The Development stage is continued in this stage. All developed media designs are now put into practise following revision. The learning materials based on CAI that have been developed are used in a real-world setting the classroom. But at this point, the researcher looked at how students responded to the created learning materials through conducting field, small-group, and individual product trials. The trial is intended to see the level of practicality of the media. Individual trials were carried out by asking 3 (three) people, small group trials of 10 (ten) people and field trials of 30 people (1 class) students from the Faculty of Economics, Indonesian Methodist University. Before carrying out the trial, students were given instructions regarding the learning media that had been developed.

The researcher/developer provides an explanation of the contents of the learning media during the implementation of the product trial. The developer takes this action to encourage students to study the content on the learning media with greater enthusiasm.

The developer gave a questionnaire to students on the final day of the trial after they had finished watching the learning materials. The purpose of this survey is to gauge the extent to which students have responded to the developed learning materials.

4.5 Evaluation

The last phase of the ADDIE development model is evaluation. The evaluation that is being discussed here is an evaluation of implementation activities because there were very few trials in this study. A final revision was made based on the evaluation results, which were derived from suggestions made by instructors and students during the trial run.

Measuring the Effectiveness of Media Use

Effectiveness is measured through pretesting and posttesting. Students take the pretest prior to receiving CAI-based learning materials, and the posttest is administered following the introduction of CAI-based learning materials to the classroom..

In order to obtain impartiality during the assessment, where students completed tests based on questions from the learning media, the researcher coded the students' names without the teacher's involvement.

Researchers encrypt student names to obtain objectivity without intervention from educators on assessments where students carry out tests according to evaluation questions contained in learning media. The scores in the pretest process show that the learning outcomes scores of 30

students are in the range of 45-74 with an average score of 56.8. The frequency of pretest results before using CAI-based learning media is presented in the following table:

Table 2. Frequency of values in the pretest phase

Mark	Frequency
45 - 49	2
50 - 54	9
55 - 59	7
60 - 64	6
65 - 69	4
70 - 74	2

Table 2 shows the learning outcomes during the pretest where there is the most frequency in the range of 50 – 54 as the average value. The data in the table can be presented in the form of a histogram as shown in the following figure:
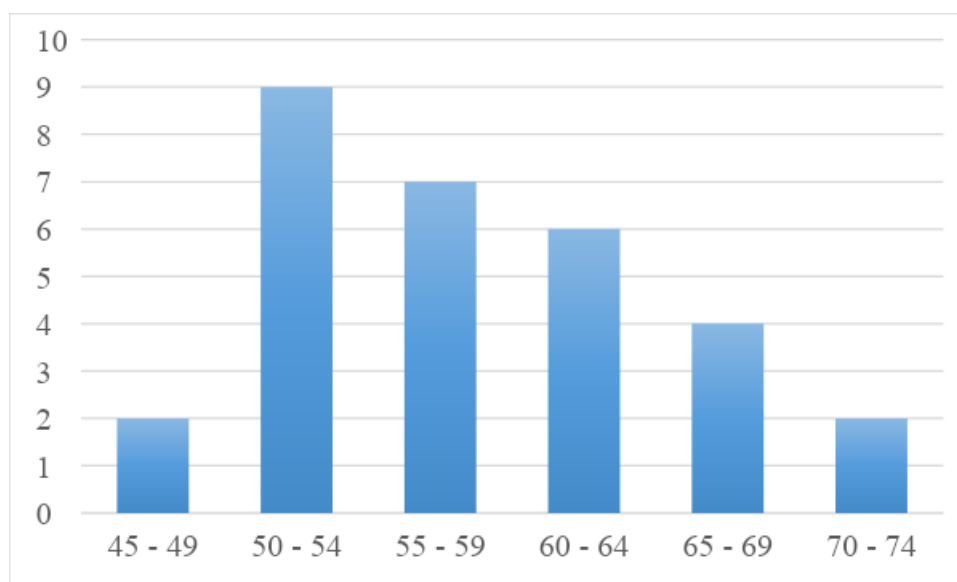

Fig. 3. Bar chart of pretest results

From the picture of the diagram, it can be interpreted that 7 students get an average score, 12 students get a score above the average, and 11 other students get a score below the average score.

Furthermore, the posttest scores were obtained after CAI-based learning media were used in classroom learning. The posttest scores show that the learning outcomes of 30 students are in the range of 75 – 92, with an average score of 83.3. The frequency of the learning outcomes of

students who have received the learning process using CAI-based learning media is presented in table 4.12.

Table 3. Frequency of values in the posttest phase

Mark	Frequency
75 - 77	4
78 - 80	9
81 - 83	2
84 - 86	6
87 - 89	4
90 - 92	5

Table 3 shows the learning outcomes at the time of the posttest, the range of values is at most 78-80 with a frequency of 9 students. The data in the table can be presented in the form of a histogram as shown in Figure 4.10 on the following page:
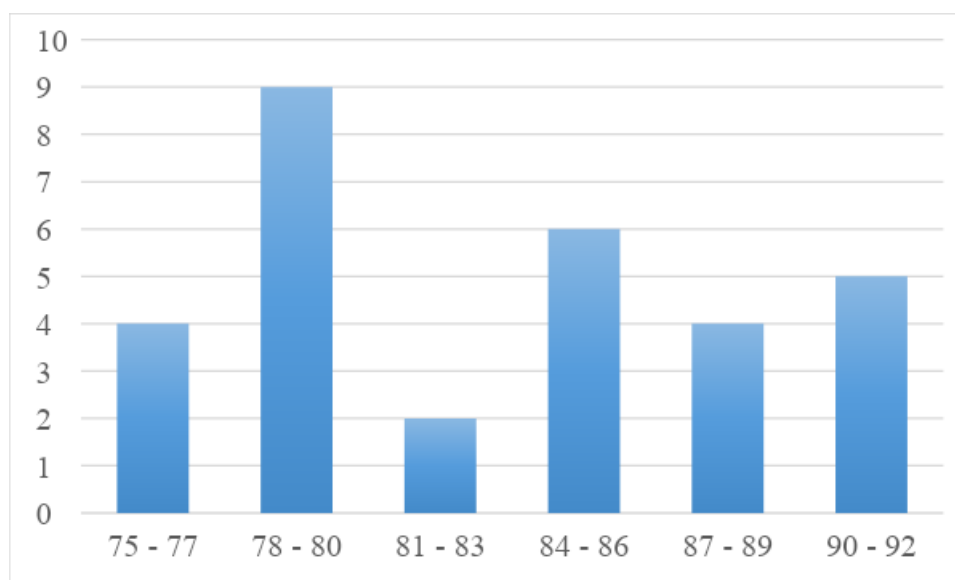

Fig. 4. Bar chart of posttest results

Based on Figure 4 it can be interpreted that 2 students get an average score, 15 students get a score above the average, and 13 other students get a score below the average.

The researcher must then compute the difference between the values from the pretest and posttest phases after obtaining the values from each. The goal of calculating the value difference is to determine how effective it is to use CAI-based learning resources in the

classroom, particularly for courses on microeconomic theory. Effectiveness is determined and interpreted using the criteria table for the N-Gain Score.

5 Discussion

Learning media that can be used as resources for students' education are the result of research and development on learning media based on CAI. Classroom instruction can make use of CAI-based learning materials as a source of knowledge.

The idea of computer-assisted learning (also known as computer-assisted instruction) refers to learning through the use of a computer. According to this CAI concept, the computer presents educational content, stores subject matter, and analyses learning assessments. The use of computers with students to deliver lesson content, provide exercises, and assess their learning progress is known as computer-assisted instruction (Anderson, 1994:197). *Computer Assisted Instruction* is one of the learning media that is very interesting and able to increase student learning motivation (Warsita, 2008:137). The term CAI (*Computer Assisted Instruction*) generally refers to all educational software accessed via a computer where students can interact with it.

Because the ADDIE development model is dynamic, effective, and enhances programme performance, it is the development model utilised in CAI-based learning materials (Warista, 2011: 7). The ADDIE model consists of 5 components that are interrelated and systematically structured, which means that from the first stage to the fifth stage, the application must be systematic and cannot be ordered randomly. These five stages or steps are very simple when compared to other design models. Its simple and systematically structured nature makes this design model easy to understand and apply. The five stages of the ADDIE development model include analysis, design, development, implementation, and evaluation.

Learning media can be used as a communication tool to help explain topics covered in class. This is because using media effectively helps lecturers convey important ideas or material to their students by equating experiences, providing similar stimulation, and anticipating differing student perceptions. in order to accomplish learning objectives in teaching and learning activities. Through a variety of procedures or learning exercises, students can actively study the material provided by educators in order to meet learning objectives that align with the relevant curriculum when they use learning media.

The creation of CAI-based learning materials was accomplished through the application of development research techniques, which are studies intended to yield specific outcomes. Bi. A (2019) explains that research and development is a subset of study that tries to produce, modify, or add a fresh touch to a "product" that will be developed in order to advance and be more effective. CAI-based learning media is the end product of this research, serving as a substitute for traditional learning resources. There is flexibility in how lecturers and students use the media—they can use it as a teaching tool or as a learning resource.

Using media as a teaching aid entails the lecturer using CAI-based learning materials for discussions, in-class questions and answers, and media use. In the meantime, students can use the media as a source of learning with flexibility, allowing them to study whenever and from wherever they have time.

The development of learning media based on CAI in the course of microeconomic theory, went through an assessment process from several experts who were competent in their fields. Material on microeconomic theory with the subject matter contained in the developed learning media obtained a score of 4.40 with the "very feasible" criterion. In the domain of multimedia aspects with material that has been compiled and loaded on media that is developed into a separate application that can run on several operating systems such as Windows. On the feasibility of the developed media also get a positive assessment with a value of 3.79 with the "decent" criteria. Furthermore, the Instructional Design expert gave an assessment of the developed learning media with a value of 4.64 with the criteria of "very feasible". The results of this study are in line with the results of research by Indah Jong on Applications *Computer Assisted Instruction* (CAI) *Crafting Interior* Home for Students concludes that the CAI application *Crafting Interior* Home for students is deemed appropriate in meeting learning targets.

When students are given demand and supply analysis material, using CAI-based learning media has a positive impact on their learning outcomes as well as their mastery of concepts and systems. This is consistent with the role of the media as an educational tool that can help professors clarify abstract ideas and systems so that students can comprehend the concepts being presented.

Thus, it can be said that the created CAI-based learning materials can be utilised for both independent student learning and the teaching and learning process in the classroom, particularly in microeconomics theory courses that include supply and demand analysis content. All things considered, the study's output is useful and successful in meeting learning goals. This study supports that of Bhaskar and Mathur, M., who investigated the effectiveness of computer-assisted instruction (CAI) in teaching geography concepts to senior secondary school students. Their findings showed that class X students who received CAI performed better academically than those who received traditional instruction. Additionally, Bliss Cornelius Sedega's study on the impact of computer-assisted instruction (CAI) on senior high school students' achievement in pie charts and histograms for core mathematics found that the CAI approach has produced numerous benefits for students' learning outcomes when compared to traditional methods for teaching and learning pie charts and histograms for core mathematics, and that it aids students in developing mathematical concepts appropriately with little assistance from teachers.

6 Conclusion

The product in the form of CAI-based learning media has very feasible results to be used in the learning process in the classroom. This is supported by several validation processes involving material, media, and instructional design experts, all of which are "very feasible" to use.

On the effectiveness test using *N-Gain Score* learning using CAI-based learning media shows an increase in learning outcomes before and after using learning media that was developed with a value of 0.68 or getting the "medium" category. Thus it can be said that CAI-based learning media is effective for use in improving the learning of microeconomics theory courses for students.

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