Developing *Computer-Assisted Instruction* Multimedia For Educational Technology Course of Coastal Area Students

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Abstract. This research aims to a) identify instructional software (interactive multimedia CDs) by developing Computer-Assisted Instruction (CAI) multimedia that is eligible to be used in the instruction of the Educational Technology course; b) analysis the role of instructional software (interactive multimedia CDs) on the Educational Technology course through the development of Computer-Assisted Instruction (CAI) multimedia to improve the quality of education and instructional activities. This is Research and Development (R&D). It employed the descriptive procedural model of development, which outlines the steps to be taken to develop a product, which is instructional multimedia. The number of subjects of the research trial or respondents for each stage was 20 people. To maintain development quality, an expert in materials outside the materials under study, an expert in materials who is also a Educational Technology lecturer, a small groupof 3 students, a medium-sized group of 10 students, and 20 students to participate in the field testing took part in this research. Then, data collection instruments were developed in two stages, namely: a) developing the instruments; and b) trying out instruments. Data on students' responses were collected using questionnaires and analyzed using descriptive statistics with percentage and categorization techniques. Based on data analysis results, it is revealed that the Computer-Assisted Instruction (CAI) multimedia developed and tried out among students during the preliminary field testing falls into the "Good" category, with the aspects of instruction, materials, and media falling into the "Good" category. Subsequently, results of the main field testing among students also suggest that it falls into the "Good" category, with the aspects of instruction, materials, and media falling into the "Good" category. Similarly, results of the operational field testing among students also suggest that it falls into the "Good" category. Thus, it can be concluded that quality of the Computer-Assisted Instruction (CAI) multimedia developed in this research falls into the "Good" category viewed from the aspects of instruction, materials, and media. In other words, overall, the quality of this multimedia belongs to the "Good" category.

1. Introduction

Nowadays, there are two challenges instructional activities are dealing with, the first one comes from a shift in the perception about the word *learning* itself and the second one comes from the existence of information and telecommunications technology that show tremendous growth. Basically, the first challenge has been answered by the theory of Constructivism, which redefine learning as a constructive process in which information is transformed into knowledge through the

process of interpretation, correspondence, representation, and elaboration. Meanwhile, the rapid advancement of information and telecommunications technology to facilitate instructional activities might lead to a shift in the learning orientation from *outside-guided* to *self-guided* and from *knowledge-as-possession* to *knowledge-as-construction*. Moreover, this technology also plays an important role in redefining the concept of justification that initially focuses on learning as merely a presentation of various knowledge into learning as a form of guidance in order to be able to carry out the socio-cultural exploration which is rich in knowledge.

In the education and training sphere, an instructional process tends to be interpreted as the process of delivering information or communication. In this case, the instructional media is an integral part of an educational institution. Utilization of instructional media is a creative and systematic effort to create experiences that can make students learn so that in the end, educational institutions will be able to produce quality graduates. There is one thing to be taken into account, i.e. the use media, especially the Computer-Assisted Instruction (CAI), among students.

Some researchers and lecturers reported improvements in students' learning quality in the instruction that employed Computer-Assisted Instruction (CAI), namely: students were better prepared during classroom instruction (Cameron, 18-21), wrote down their papers more effectively, did better in the exams (Garham & Kaleta, 8(6)), and had deeper understanding and more meaningful discussion related to the course taught (King, KP, 2002: 231-246). Research conducted by Thomson Learning shows tasks tend to be completed faster and more accurately in the blended-learning environment (Martyn, M, 2003: 18-23).

So far, there are two problems related to the use of instructional media at IAIN (State Institute of Islamic Studies) Manado, namely availability and utilization. The availability of media is so limited that the utilization of media among lecturers during instruction is minimal. They usually use media in the form of printouts (lecture notes, modules, handouts, textbooks, magazines, newspapers, and so on) as the instructional media, coupled with simple equipment such as black/white boards and chalks/markers. As for audio-visual media such as videos/films, audio cassettes, and TV/Radio broadcasts, and electronic media (computer, LCD, and the internet), they have not been used intensively. The second problem concerns the use of media. Lecturers often use media in the form of printouts because such media can be easily developed and obtained from various sources. However, the majority of such media depend heavily on verbal symbols (words) which are abstract, thus requiring that students have a very high level of abstraction skills and this can be demanding. This is why the use of such media requires that lecturers be creative, in addition to careful thought with regard to instructional activities. In fact, many lecturers do not carefully select the instructional media they use by taking into account instructional consideration, they simply take pot luck. There are also those lecturers who use sophisticated media even though they do not need them.

Another equally important problem is lack of interest among lecturers to use instructional software (interactive multimedia CDs) to deliver course materials, even though at IAIN Manado, there have been facilities that are quite representative such as a computer laboratory which is quite conducive consisting of 20 units of PCs (Personal Computers) located at a separate building from the lecture building. Moreover, there is also a multimedia-based language laboratory which has been equipped with up-to date-software, making it have a dual function, i.e. to be used as a computer laboratory as well.

Consequently, it is necessary to develop computer-assisted instruction multimedia, especially to facilitate the instruction of the Educational Technology course as one of the learning sources and it is expected provide a stimulus to computer-assisted instruction of other courses. Moreover, lecturers have to be able to adopt this computer-assisted instruction as well.

Educational Technology as one of the courses students majoring in Islamic Education at the Faculty of Tarbiyah have to take is expected to facilitate the development of instructional media which constitute an integral part of learning in universities. So, in the near future, all courses taught at IAIN Manado in general and at the Faculty of Tarbiyah in particular can be delivered by adopting Computer-Assisted Instruction (CAI).

Based on the background above, the researcher believes that the time has come for IAIN Manado, which has just transformed from a STAIN (the State School of Islamic Studies) into an IAIN (the State Institute of Islamic Studies) and as the only state Islamic education institution in Manado to make the most of its facilities given rapid development of ICT, both in daily life and in the

educational sphere, thus requiring that the academicians of IAIN Manado be familiar with the use of technology to deal with rapid advances in ICT. Based on the foregoing, this research is entitled "Developing *Computer-Assisted Instruction* (Cai) Multimedia for the Educational Technology Course of Students Majoring in *Tarbiyah* at IAIN Manado".

2. Method

This is Research and Development (R&D). Research and Development (R&D) is product-oriented research. It employed the descriptive procedural model of development, which outlines the steps to be taken to develop a product, which is instructional multimedia. There were three basic stages developers had to followed, namely conceptualizing problems, developing a product, and trying out the product developed.

This research adopted the model proposed by Borg & Gall (Borg, W.R., & Gall, M.D, 1983: 775) based on a number of considerations: 1) This model has a clear prescriptive theoretical foundation because it sets optimal learning methods. this is consistent with the objectives of this activity to develop Computer-Assisted Instruction; 2) the development steps proposed in this model are detailed yet simple and flexible; and 3) this model can be used as a way to solve problems relating to instructional activities operationally.

Furthermore, subjects of the research trial or respondents for each stage was 20 people. To maintain development quality, an expert in materials outside the materials under study, an expert in materials who is also a Educational Technology lecturer, a small groupof 3 students, a medium-sized group of 10 students, and 20 students to participate in the field testing took part in this research.

The data collection instruments were developed in two stages, namely: a) developing the instruments, where at this stage, research instruments both questionnaires and tests were developed by the researchers. The questionnaires were developed based on the guidelines developed mostly based on instruments of the previous research into multimedia development, with necessary modification; and b) trying out instruments, where at this stage, the instruments that had been drawn up were tested to gain feedback for betterment of the instruments in order that they could be used as valid research instruments. In this research, the criterion for determining instrument quality was validity, especially logical validity.

As for data collection methods and instruments, they are described as follows: 1) To collect data whether the concept proves true or not, the researchers held discussion and handed in the product developed along with the evaluation sheet to be reviewed by experts and asked for their feedback relating to the product developed; 2) To examine the depth of the materials viewed from the indicators of display quality and instructional quality, questionnaires using a Likert scale were used, in addition to having discussion with a small group of responders and observation for the field testing; 3) Data on the effectiveness and efficiency of the product were collected by looking at students' work and time they spent during the field testing; 4) To examine the aspect of attractiveness, the researchers directly observed the students and from the observation results; 5) Students' improved learning outcome was seen by comparing results of the test and those of the previous one.

Techniques used to determine criteria for the score gained by the quality of the product developed were:

1. Data obtained from questionnaires on students' responses were converted first into interval data as follows:
   Very Good = 5 (100% consistent with the aspect contained on the questions)
   Good = 4 (80% consistent with the aspect contained on the questions)
   Fairly Good = 3 (60% consistent with the aspect contained on the questions)
   Poor = 2 (40% consistent with the aspect contained on the questions)
   Very Poor = 1 (20% consistent with the aspect contained on the questions)
2. Then, the obtained score was converted into a grade using a 5-point scale according to the table cited from Sukardjo (2005: 55) below:

Table 1. Score-to-Grade Conversion using a 5-Point Scale

Score Interval	Grade	Category
$\mathbf{X} > \overline{X}_i + 1.80$ SBi	A	Very Good
$\overline{X}_i + 0.60$ SBi $< \mathbf{X} \leq \overline{X}_i + 1.80$ SBi	B	Good
$\overline{X}_i - 0.60$ SBi $< \mathbf{X} \leq \overline{X}_i + 0.60$ SBi	C	Fairly Good
$\overline{X}_i - 1.80$ SBi $< \mathbf{X} \leq \overline{X}_i - 0.60$ SBi	D	Poor
$\mathbf{X} \leq \overline{X}_i - 1.80$ SBi	E	Very Poor

Description:

$\overline{X}_i$ = Ideal mean = ½ (maximum ideal score + minimum ideal score)

SBi= Ideal standard deviation = 1/6 (maximum ideal score – minimum ideal score)

X = Actual score

Based on the conversion formula in Table 1 above, clear description on how to convert quantitative data into qualitative data is obtained. Guidelines for converting quantitative data into qualitative data is presented in the following table:

Table 2. Pedoman Pengubahan Data Kuantitatif Menjadi Data Kualitatif

Score Interval	Grade	Category
$\mathbf{X} > 4.21$	A	Very Good
$3.40 < \mathbf{X} \leq 4.21$	B	Good
$2.60 < \mathbf{X} \leq 3.40$	C	Fairly Good
$1.79 < \mathbf{X} \leq 2.60$	D	Poor
$\mathbf{X} \leq 1.79$	E	Very Poor

Description:

Maximum score = 5 $\overline{X}_i$ = ½ (5 + 1) = 3

Minimum score = 1 SBi = 1/6 (5-1) = 0.67

X = Actual score

3. To determine the mean of the scores obtained by the product developed, the following formula was used:

$$\overline{X} = \frac{\sum X}{n}$$

Description:

$\overline{X}$ = Mean

$\sum X$ = Total Score

N = Total Number of Respondents

Based on the conversion formula presented in Table 2 above, it is clearly described how to convert data on the percentage of learning mastery into qualitative data.

3. Results of Research and Discussion

A. Data from Field Testing and Suggestions to Revise the Product

1. Data on Students' Responses in the Preliminary Field Testing

There were a total of 3 respondents in the preliminary field testing, allof whom were students. Each student gave their responses separately. The purpose of the preliminary field testing was to determine eligibility of the initial quality of the product developed. At this stage, the evaluation focused more on the process factor rather than the factor of learning outcomes. The comparison of the means obtained in the Preliminary Field Testing can be seen in the following bar chart:

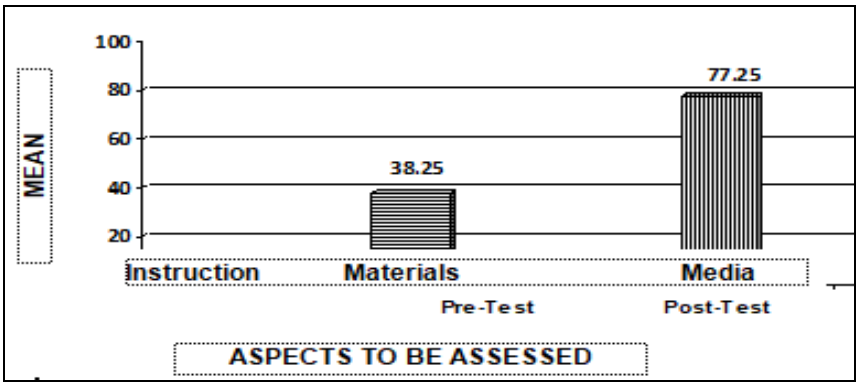


Figure 1. The Bar Chart Illustrating Students' Responses in the Preliminary Field Testing

In general, suggestions from the students to revise the Computer-Assisted Instruction (CAI) Multimedia product that had been developed in the preliminary field testing are: a) that the materials were too long; b) that the background should be made more attractive.

2. Data on Students' Responses in the Main Field Testing

In the main field testing, the respondents consisted of 10 students. Each student gave their responses separately. The purpose of the main field testing was the same as that of the preliminary field testing, what made them different was the number of research objects. In the preliminary field testing, the number of the objects under study was 3 students, while in the main field testing, the number of the research objects was 10 students. The comparison of the means obtained in the Main Field Testing can be seen in the following bar chart:

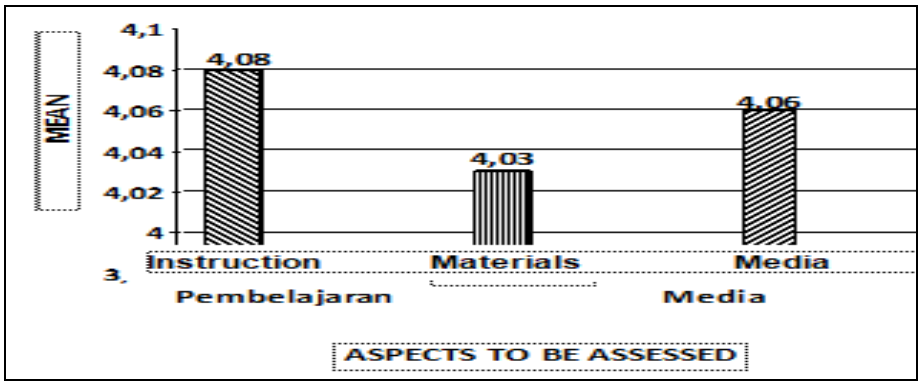


Figure 2 The Bar Chart Illustrating Students' Responses in the Main Field Testing

3. Data on Students' Responses in the Operational Field Testing
   a) Data on Quality of the Multimedia Product
      1) The Instruction Aspect

The percentages of the students' responses to the computer-assisted instruction multimedia viewed from the instruction aspect are presented in the following figure:

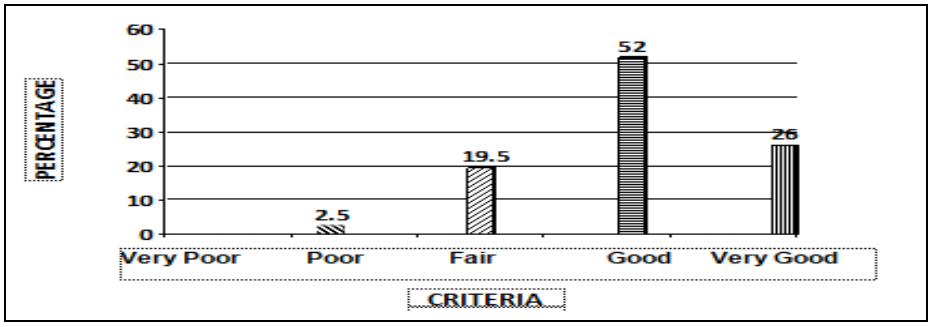


Figure 3 The Bar Chart Illustrating the Percentages for the Instruction Aspect

2) The Materials Aspect

The percentages of the students' responses to the computer-assisted instruction multimedia viewed from the materials aspect are presented in the following figure:

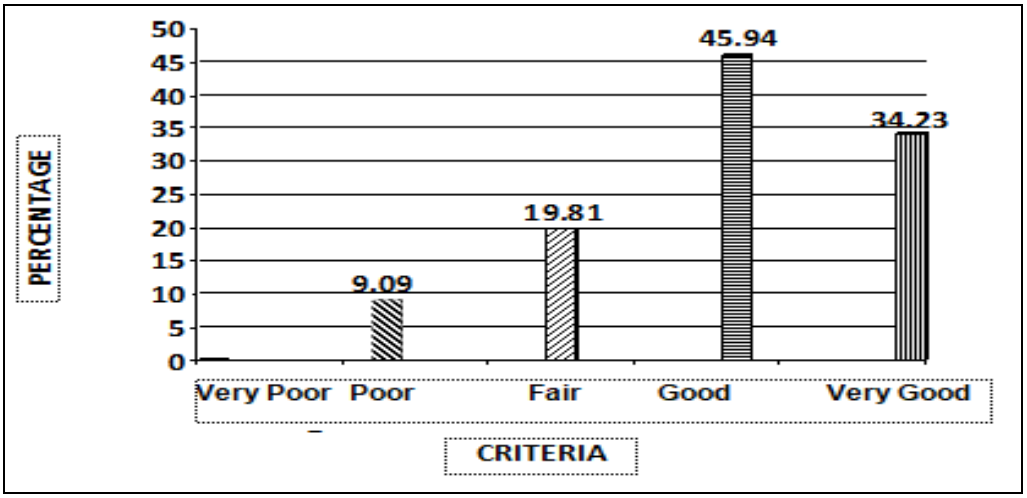


Figure 4 The Bar Chart Illustrating the Percentages for the Materials Aspect in the Operational Field

3) The Media Aspect

The percentages of the students' responses to the computer-assisted instruction multimedia viewed from the media aspect are presented in the following figure:

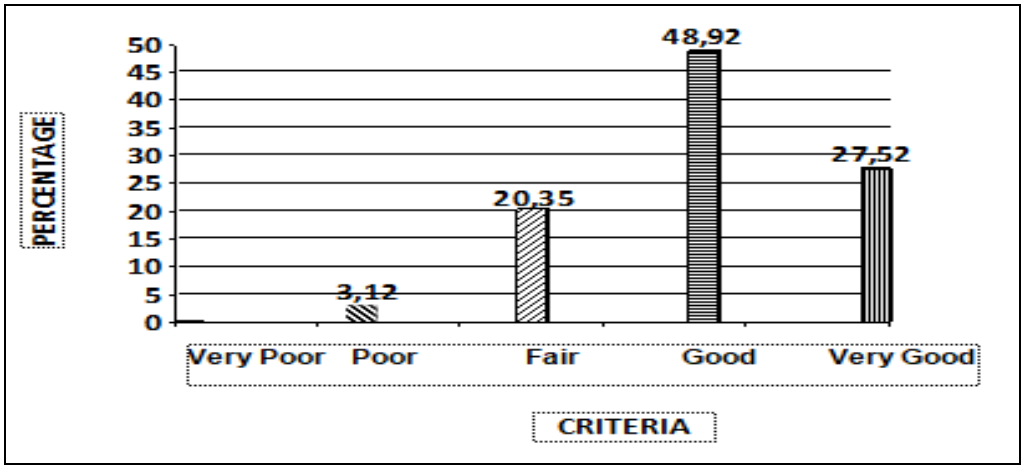


Figure 5 The Bar Chart Illustrating the Percentages for the Media Aspect in the Operational Field Testing

b) Data on the Motivation and Benefit Aspects

The field testing also generated data on the aspects of motivation and benefits perceived by the students with regard to the use of multimedia in the instructional activities of the Educational Technology coursee. The data are presented as follows:

Table 3. Percentages of Students' Responses

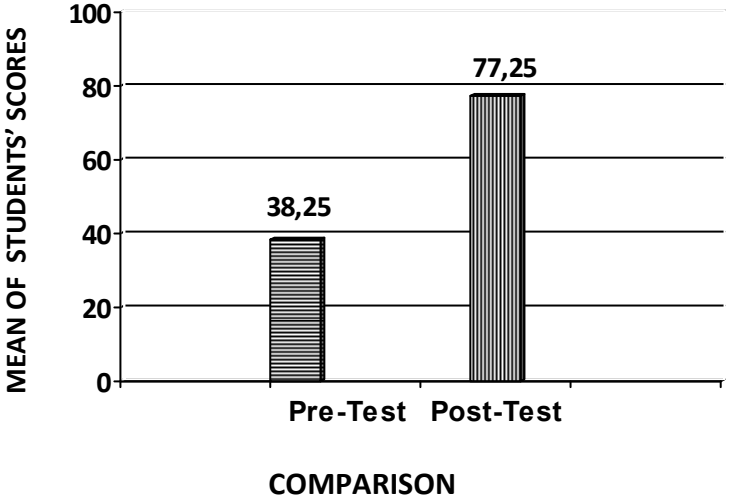
No.	Indicator	Yes	No
1	Multimedia helps me understand materials about Educational Technology.	20	0
2	For me, the concept presented is easy to understand.	17	3
3	The materials about Educational Technology presented challenge me to study better.	18	2
4	I want to learn about many things using this instructional multimedia.	20	0
5	This instructional multimedia gives me an opportunity to study at my own pace.	20	0
6	This instructional multimedia helps me study Educational Technology.	20	0
7	Answering the evaluation section helps me know whether I understand the materials about Educational Technology or not.	20	0
8	The materials about Educational Technology presented using multimedia allow me to gain understanding more quickly.	17	3
9	I love studying using multimedia.	20	0
10	I hope that the instructional acivities of the other courses use multimedia as well.	18	2
11	Without assistance from the lecturer, I will be confused and have no confidence.	5	15
12	The work sheet given helps me to study more actively and easily.	17	3
13	The materials are presented attractively using various media (texts, images/tables, audio, animation, and videos).	20	0
14	I have problems understanding some of the instructions.	3	17
15	I join the instructional activities continuously.	18	2

Based on the table above, in general, it can be concluded that there are a number of benefits students can get from studying using multimedia. This helps increase students' enthusiasm to study the materials presented. In conclusion, this multimedia positively affects the learning process.

c) *Pre-test* dan *Post-test*

The number of respondents in the Operational Field Testing was 20 people. A pre-test was held previously with a total of 20 questions, then a post-test was conducted afterwards with the same number of questions. The purpose of Operational Field Testing was to determine whether the use of the product that had been developed has a positive effect on the expected learning outcome. The comparison of the mean between the Pre-test and the Post-Test in the Operational Field Testing can be seen in the following bar chart:

Figure 6. The Bar Chart Illustrating the Comparison of the Mean Between the Pre-test and the Post-test in the Operational Field Testing



B. Final Product Analysis and Dissemination

After following a number of testing stages, both the limited feasibility test from an expert in materials and an expert in media, and field testing that included preliminary field testing, main field testing, and operational field testing, the computer-based multimedia product resulting from the development is deemed eligible to be a final product that can be disseminated and implemented among users. This eligibility is evident from the overall assessment results of almost all stages where the product gets a grade "B" and thus, falls into the "Good" category. This is consistent with the researchers' expectation who expect that in terms of eligibility, the product developed by the researchers should at least get a grade "C" and falls into the "Fairly Good" category.

In addition to its eligibility to be used, the computer-based multimedia product presented in the form of interactive multimedia CDs has a number of advantages and disadvantages as well. The first advantage is that the making of these interactive multimedia CDs using program *Macromedia Flash 8* proves much more practical and offers other advantages such as more attractive display, easy to operate, and so on and thus, students do not necessarily have to master this program in advance. The second one is that these CDs will run automatically once it has been inserted into the CD ROM on the computer because these interactive multimedia CDs have been published in the form of an "exe" file and adopts the "autorun" system. This computer-based multimedia also constitutes a major contribution as so far no Computer-Assisted Instruction (CAI) multimedia has been developed previously for the Educational Technology course, especially at IAIN Manado, and therefore both lecturers and students expect that this interactive multimedia that has been developed can be disseminated immediately in the form of a CD.

The use of these interactive multimedia CDs also has a significantly positive effect on students' learning outcome, especially for materials relating to Educational Technology as proved in the main field testing, where the percentage of students reaching the level of learning mastery after the implementation of the computer-based multimedia developed is equal to 72.25%.

In addition to having several advantages, this Computer-Assisted Instruction (CAI) multimedia also has several disadvantages, namely: (1) Program *Macromedia Flash 8* used to create interactive multimedia CDs requires numerous supporting files thus taking time; (2) The making of these interactive multimedia CDs needs meticulousness as the program *Macromedia Flash 8* is very prone to error if the developer does not carefully create these interactive multimedia CDs; and (3) The selection of the type of music fails to accommodate the whole students in terms of their taste in music because they usually have different learning styles and music preferences.

4. Conclusions

Based on findings of the research and development of this multimedia product, the following conclusions can be drawn: Findings of the research into the development of this Computer-Assisted Instruction (CAI) multimedia syggest that: in the preliminary field testing, the developed Computer-Assisted Instruction (CAI) multimedia tried out to 3 students falls into the "Good" category, with the aspects of instruction, materials, and media falling into the "Good" category. Subsequently, results of the main field testing where the product developed was tried out to 10 students also suggest that it falls into the "Good" category, with the aspects of instruction, materials, and media falling into the "Good" category. Similarly, results of the operational field testing where the product developed was tried out to 20 students also suggest that it falls into the "Good" category. The quality of the Computer-Assisted Instruction (CAI) multimedia developed in this research falls into the "Good" category viewed from the aspects of instruction, materials, and media. Overall, the quality of this multimedia belongs to the "Good" category.

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