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Validity of Computer Based Learning Media to Improve Junior High School Students' Learning Outcomes on Ecosystem Topics

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Abstract The aim of this study was to determine the level of validity of computer-based learning media on ecosystem materials for grade VII junior high school students. The parameters measured were the validity of the computer-based learning media from the aspect of material, readability, interaction in media program, navigation button, grafity, readability, and interaction in media program. This study uses developmental stage that followed Dick and Carey (2001) model. The results of the validation by material and design experts were obtained using a questionnaire instrument. Based on the validation result of material expert showed that: (1) Material aspect was 89.28% (2) Readability aspect was 92.85% (3) Interaction in media program aspect was 95.83%. The validation result of media expert showed that: (1) navigation button aspect was 100% (2) Grafity aspect was 90.9% (3) Readability aspect was 96.4% and (4) interaction in media program aspect was 95.83%. It can be concluded that Computer based Learning Media product is feasible to use for learning in ecosystem material based on its validity.

Keywords: Learning media, Computer based learning media, Ecosystem, Learning outcomes

INTRODUCTION

To ensure a successful learning process, instructors must be able to choose and implement appropriate instructional media in line with the curriculum. The selection of instructional media should excite the senses of sight, hearing, and smell, or conform to the learning hierarchy. Success or failure relies on how the instructor organizes the learning system, which includes the techniques, methods, and media relevant to the subject matter delivered to the students.

Based on observations made at SMP Negeri 3 Medan, researchers have uncovered a serious reality about the learning outcomes of students in ecosystem. According to statistics provided by a biology instructor during the 2012-2013 academic year, around 54 percent of students failed to meet the basic requirements for the regular exam of ecosystem.

The absence of instructional media used by biology teachers is one of the causes of this issue. Teachers seldom create interactive media; thus, students get bored and the learning process is monotonous and less engaging. Students do not comprehend the subject as a result of ineffective classroom instruction. In reality, when considered from the perspective of the definition, the learning process is fundamentally a communication process, meaning the process of transferring a message from the message source to the message recipient through the media. In addition, educators never employ multimedia rooms for educational purposes.

This issue is not simply a local one, but a global one as well. In Germany, Pfundt and Duit (2002) found that students had difficulties grasping fundamental ecological concepts such as food chain and food web due to their complexity and interconnectedness, even in terms of the most fundamental scientific information pertaining to the biological environment. Children must be taught ecologically sensitive character education and ecosystem education from a young age (Febriani et al., 2020). The availability of computer-based learning materials on the market, particularly in ecosystem interactions, is limited. Existing media are often less relevant and less communicative, therefore students did not completely comprehend the subject matter. For there is a need for the creation of interactive media that engages students in biology study.

The majority of instructional media on the market are merely in the form of games/exercises and do not consider compliance with the competence criteria. Some learning materials on the market lacked a learning result indicator as a standard. The teacher-created instructional materials may facilitate the student's content comprehension. In addition, it may boost instructors' creative and innovative ability to generate professional educators.

Based on a need analysis, alternative media that can entice students to study biology, particularly the theme of interaction in ecosystems, are required. To maximize the contribution of media to students' learning outcomes, media and technology should be

included into the students' learning outcomes. Globally, the improvements in numerous sectors such as technology or information are highly associated with educational performance in the present day (Nasution et al., 2017). Experts have innovated the learning experience in order to enhance the learning opportunity. The development of learning may take the shape of models, methodologies, alternative learning media, and instructional materials (Harahap et al., 2020). Numerous information and communication technology devices may be used as learning media, including films, television, diagrams, textbooks, learning modules, audio learning, video learning, computer-based learning, and Web or internet-based learning (Manggopa et al., 2019). The availability of media may aid instructors in communicating learning information to students (Naz & Rafaqat, 2014).

CAI-based learning media will be created as one of the alternative media. The CAI-based learning media of the Biology subject ecosystem are designed to facilitate the delivery of course information by offering a medium that is more exciting, appealing, and simple to comprehend. Rapid growth has occurred in the use of technology, such as the computer, to enhance educational success (Harahap et al., 2019).

Teachers would play a crucial part in the process of teaching and learning. The teacher's competence, knowledge, experience, attitude, and delivery methodology will undoubtedly aid in the development of relevant course material. It is believed that learning media will continue to be a significant learning platform in the foreseeable future, particularly for skill-based learning programs (Nazir, 2012). The use of technology in education may transform instructors into professionals, hence boosting the quality of education (Skryabin et al., 2015).

Thus, the use of computers in learning activities may enhance student comprehension of the subject presented. Multimedia, according to Vaughan (2011), is a computer-based system that can incorporate many types of material, including text, video, graphics, animation, and interaction. This multimedia feature enables the flexible presentation of learning topics via computer-based media.

In addition, according to Chaudari (2013), Computer Assisted Instruction (CAI) is a supplemental instructional approach for successful teaching. This may aid educators in arranging relevant teaching-learning experiences and adopting creative teaching strategies. In the context of education, Macromedia Flash may be compared to a blank canvas on which instructors can create animations, pictures, text, and sound. This involves creating interactive, engaging, and instructional tools for pupils.

Therefore, the story will be included into the Macromedia Flash animation media production. It intends to accomplish the desired learning goals. The Development of CAI-based learning media using Macromedia Flash software with the expectation of enhancing student learning outcomes, in line with the context surrounding the student's life, is anticipated to improve student learning outcomes.

Learning through CAI-based learning media employing macromedia flash software has never been applied at SMP Negeri 3 Medan.It is anticipated that CAI-based learning media will assist students in comprehending the issue of interaction in ecosystems, hence enhancing their learning outcomes.

A research on the development of CAI-based learning media was undertaken based on the description. This article focuses only on the degree of validity of computer-based learning media on ecosystem materials for seventh graders.

METHOD

Research Design

The study on development employed the Dick and Carey model (2001). The model's stages are shown in Figure 1.

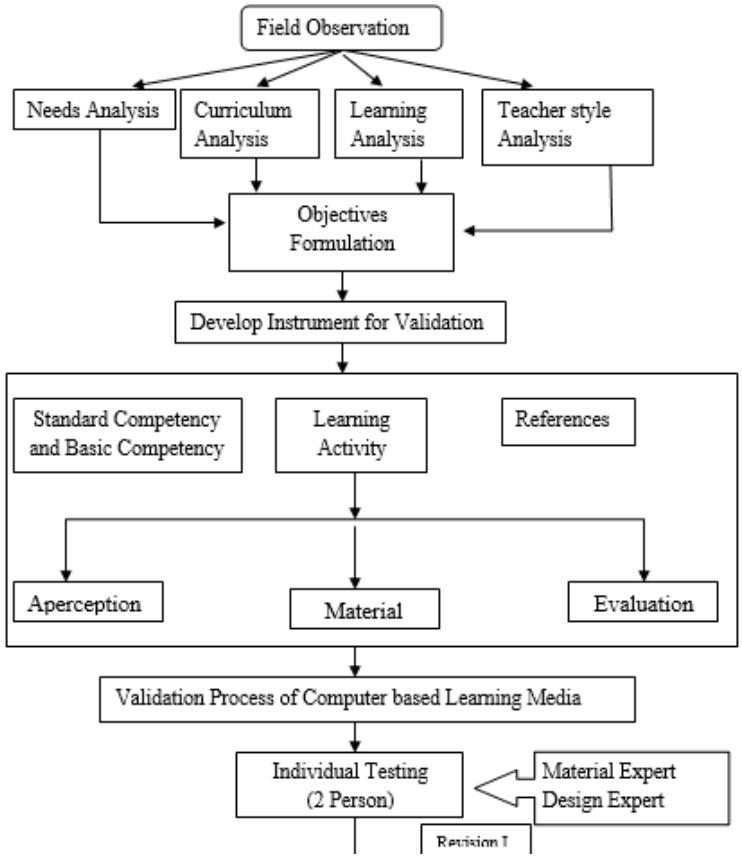


Figure 1. Design of computer-based learning media developmental research based on Dick and Carey model (2001).

Steps I. Needs Analysis

This process begin with field observation. This observation aims to: (1) collect data on the learning outcomes of seventh-grade SMP Negeri 3 Medan students about ecosystem interactions; (2) Observation of the performance and state of the student's learning style. Based on the results of an observation conducted at SMP Negeri 3 Medan, the researchers determined that the seventh-grade students' learning outcomes in Biology, particularly regarding the issue of ecosystem interactions, are unsatisfactory. The data score for their daily exam during the even semester of 2012/2013 revealed that around 54 percent of pupils did not meet the minimal threshold for completeness (KKM 70) on the ecological issue.

Step II. Curriculum Analysis

Curriculum analysis is the process of defining and analyzing the competencies that seventh-grade SMP Negeri 3 Medan students must master. Students are able to explain the food chain, food web, food pyramid, abiotic and biotic interactions, and interactions among biotic components, according to the curriculum.

Step III. Learning Analysis (Basic Competence and Indicator)

The third phase included doing an analysis of fundamental competence and learning indicators that should be attained by students. This refers to the standard competency defined by school administration.

Step IV. Teacher Style Analysis

Through interviews with Biology teachers, researchers have discovered that teachers use media less often and seldom create interactive media. The instructor has never used the multimedia room in the learning process. Consequently, the learning process is monotonous and less engaging.

Step V. Specific Goals Formulation

Based on need analysis, curriculum analysis, learning analysis, and instructor style analysis, the researcher will attempt to create CAI-based learning media using Macromedia Flash as a solution to the school's problems. This research's particular objectives are: (1) creating Learning media as a tool for learning systematically and explicitly; and (2) improving student learning outcomes.

Step VI. Develop instrument for validation

The validation sheet and questionnaire are instruments used to evaluate the validity of the learning medium. The researcher created the validation instrument based on the criteria for high-quality educational media. There are two distinct sorts of validation sheets: one for material experts and one for learning design experts.

Step VII. Develop draft learning media

Using Macromedia flash software, a researcher designed the components of learning media as shown in figure 1. Macromedia Flash is a commonly used interactive vector-based animation software for web design. As an animation software, Flash has an edge over other animation tools due to its action script capability, which allows for more interactive animation. First, the researcher organizes the design of CAI-based learning media material in accordance with the learning goals and indicator established by school administration. The instructional materials, animated images, and sounds to be exhibited in learning media were gathered by researchers. In addition, these assets will be chosen and used as an overview description of the course's content, followed by the creation of a storyboard for building computer-based learning media. The components of instructional media are shown in Table 1.

Table 1. The components of learning media.

No.	Component	Description
1.	Background	The background of the learning media was obtained from a website and color-adjusted accordingly. The background subject is environment that is pertinent to the topic
2.	Navigation buttons	Consist of Competency, Lesson I, Lesson II, Lesson III, Evaluation, References and Next button and sound button
3.	Introduction	The tittle of Learning media The authors of learning media
4.	Category	Standard competence, fundamental competence, and learning goals make up competencies. It was predetermined by the school administration. The competence is also attained via the examination of developmental phases. Lesson I, contain of Interaction between abiotic and biotic components and the picture of example. Lesson II, contain of Interaction among biotic component and the picture of example. Lesson III, contain of Interaction among components and the picture of example. Exercise, create many options. The questions were taken from the manual to assess the cognitive abilities of the students. References, was learning resources that used in this lerning media. Profile, consist of the biodata of researcher. Help, contain of navigation button in learning media, used to simplify user.

Step VIII. Validation stage

In the process of verifying, a validation sheet is necessary to validate the learning media requirements and eligibility of the predefined responder. The response is not only a person with specialized knowledge in generating learning media, but also instructors and students who execute the teaching and learning process.

There are three processes in the process of validating learning media:

a. Validation by a material expert on the issue of interaction in the ecosystem. The subject of this validation procedure was a lecturer from the State University of Medan's Biology department (Drs. Puji Prastowo, M. Si). He is a professor at the State University of Medan's Biology education program's Ecology subject. Media programs were evaluated based on their Material, Readability, and Interaction, according to material experts.
b. Validation by an expert in learning design. The topic of this validation procedure was Computer Application lecturer (Dr. R Mursid, M. Pd). He was a professor and secretary for the Postgraduate Educational Technology program at State University of Medan. It was determined via evaluation how to enhance the quality of media. In media programs, a media expert appreciated the navigation button, the graphics, the readability, and the interactivity.
c. Revisions are based on material and design expert evaluations. Evaluation might be in the form of direct criticisms or recommendations, or via a validation sheet and questionnaire.

Data Analysis

Data about the performance of Computer-based learning media are collected from all validation sheets. Research instrument were in Likert scale that are given certain score such as score 4 (very good), score 3 (good), score 2 (less good), score 1 (not good). Then data will analyzed quantitative descriptively, by calculating pecentage of indicator aspect for every category in learning media evaluation.

$$\text{Score Percentage} = \frac{Number\ of\ indicator\ for\ each\ category}{Number\ of\ total\ indicator\ categories} \times 100$$

(Adisendjaja, 2008)

The calculation result by using formula above, it will be produced number in percentage form. Score classification will be changed into cassification in percentage form (Sugiyono, 2011), then it will be interprated in to the qualitative sentence in Table 2.

Table 2. Percentage criteria for indicators.

Score	Criteria	Percentage
A	Very Good	$81\% \leq X \leq 100\%$
B	Good	$61\% \leq X \leq 80\%$
C	Moderate	$41\% \leq X \leq 60\%$
D	Not Good	$21\% \leq X \leq 40\%$
E	Very Less Good	$0\% \leq X \leq 20\%$

FINDINGS AND DISCUSSION

Based on the results of an observation conducted at SMP Negeri 3 Medan, the researchers determined that the seventh-grade students' learning outcomes in Biology, particularly regarding the issue of ecosystem interactions, are poor. The data score for their daily exam during the even semester of 2012/2013 revealed that around 54 percent of pupils did not meet the minimal threshold for completeness (KKM 70) on the ecological issue.

This is a complex notion because of the material substance of the ecosystem, such as the food chain and food web. Through interviews with Biology teachers, researchers have discovered that teachers use media less often and seldom create interactive media.

Teacher has never included multimedia room into the instructional process. Consequently, the learning process is monotonous and less engaging. Students will have an easier time grasping the topic if they are provided with a systematic and clear explanation of how complex materials function. It is implementable via the use of computer-based learning material.

After conducting a problem and need analysis, grade 7 Computer-based Learning materials on the theme of interactions in ecosystems were designed based on the components that should be grouped according to established specifications.

Dr. R. Mursid, M.Pd., validated the media expert validation of CAI-based learning media creation, in this instance learning media of interaction in ecosystem issue for seventh grade. The media specialist's evaluation of the navigation button was perfect. The media expert's evaluation of the grafity component yielded a score of 90,9 percent. The media expert's evaluation of the element of readability was 96.4 percent and the evaluation of the aspect of engagement in media programs was 95.83 percent. Figure 2 depicts the diagram of the media expert's CAI-based learning media evaluation.

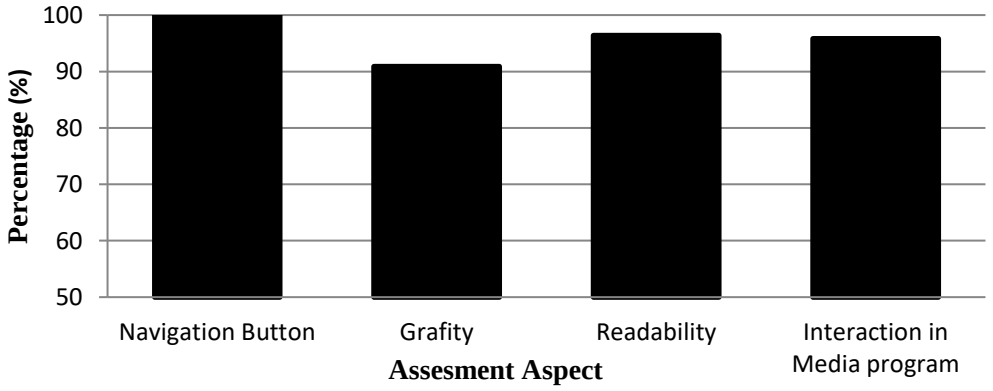


Figure 2. CAI-based learning media assessment by media expert (% values refer to the media evaluation). Assessment value of navigation button, grafity,

readability, and interaction in media program was measured by using Likert scale with scale 1-4. The assessment was conducted before treatment.

Drs. Puji Prastowo, M.Si., undertook the validation of learning materials. The average percentage of the material expert's evaluation of the material element was 89.28 percent. The expert's evaluation of the readability of the content yielded a score of 92.85 percent. The material expert's evaluation of the element of program media engagement was 95.83 percent. Figure 3 depicts a diagram of CAI-based learning content evaluation by subject matter expert.

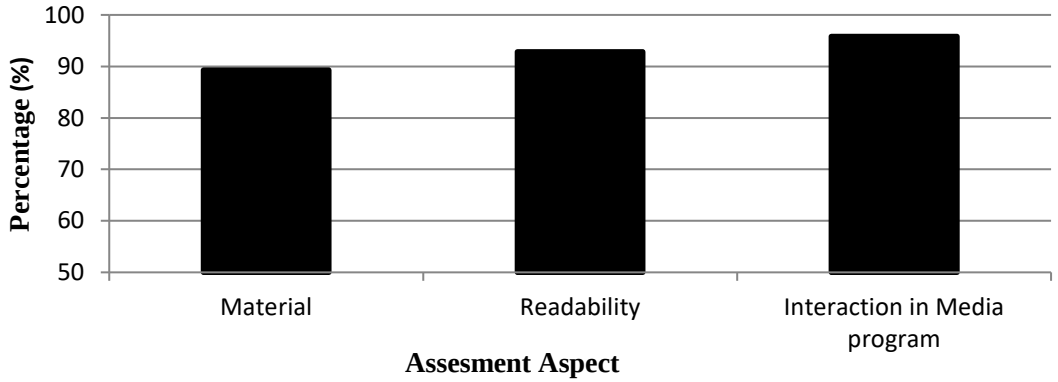


Figure 3. CAI-based learning media assessment by material expert (% values refer to the media evaluation). Assessment value of material, readability, and interaction in media program was measured by using Likert scale with scale 1-4. The Assessment was conducted before treatment.

The following recommendations and enhancements were made by media and content specialists:

a. The introduction of learning material was less engaging since it lacked a video. Revision should be performed by including video at the beginning of the class to increase its appeal.
b. The Tut Wuri Handayani logo should be deleted.
c. Adding a help and profile button to improve user experience.
d. The evaluation button has been renamed "exercise".
e. The arrangement of the buttons was altered to make it more attractive.
f. Add sound to each resource to make them more engaging.
g. At predation-related content, which animals are detailed to facilitate pupils' comprehension.
h. By modifying the example of commensalism, symbiosis and antibiosis become everyday examples that students often meet.
i. The increased font size makes it easier for kids to read.

j. Provide distinct color options for the title, description, and examples to make them more distinct.

The updates of CAI-based learning media in compliance with the recommendations and enhancements made by media and subject matter experts are as follows:

Before **After**

A

Initial appearance before adding video

Appearance after adding video

B

Initial appearance before deleting logo

Appearance after deleting logo

C

Initial appearance before adding Profile and Help button

Appearance after adding profile and help button

D

Initial appearance before moving the button

Appearance after moving the button

E

Initial appearance before adding an explanation

Appearance after adding an explanation

F

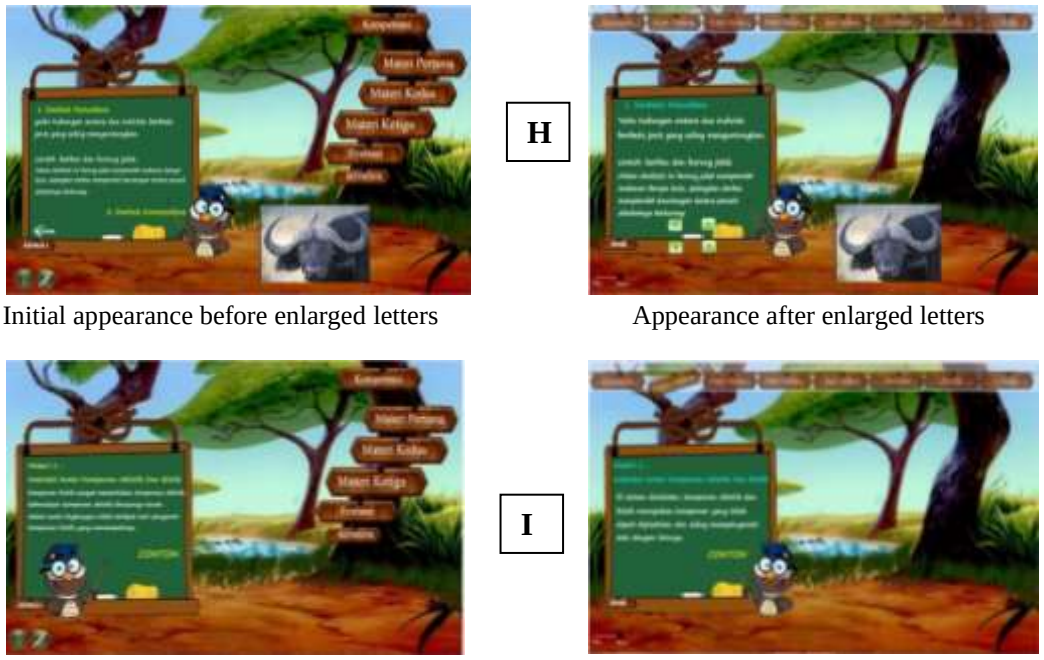
Initial appearance before changing the examples commensalism symbiotic

Appearance after changing the example commensalism symbiotic

G

Initial appearance before changing

Appearance after changing the example



Initial appearance before enlarged letters | Appearance after enlarged letters

Initial appearance before color variation | Appearance after color variation

Figure 4. Display of revision by media expert and content expert.

Material expert verified CAI-based learning media based on three criterion evaluation aspects, namely, the material aspect, the readability aspect, and the engagement in media program aspect. The material expert's evaluation of the material's quality indicated that the average % for the category was excellent. The assessment results suggested that the breadth of content was beyond the scope of the students' abilities, and the examples of subject matter presented are not relevant to everyday life. Revisions were made to the predation content, describing which species benefitted from it, and the examples of commensalism, symbiosis, and antibiosis were transformed into real-world examples that students often met in their everyday lives.

As a consequence of the evaluation, it was determined that the substance of the materials on which the generated learning media were based met excellent overall assessment standards. The expert's evaluation of the material's readability was likewise quite positive. This meant that the content of the learning material belonged to the feasible category and was appropriate for use as learning media. The outcome of the material expert's evaluation of the media contact part of the program was quite positive. As a consequence of the evaluation, it was also determined that the content of the materials from which the learning media were derived was, on the whole, of a very high quality and that the criteria for evaluating it were sound.

According to a Media expert, the CAI-based learning media in the interactions in ecosystem topic for grade seven, based on the Navigation button, grafity, readability,

and interaction in the media program, was eligible for field testing with revision, namely the addition of color variation in text, making differentiation simple. The Learning media intended for use throughout the learning process should be changed based on the advise of a media specialist.

The media expert evaluation results for the navigation button belong to the excellent category. The media expert's evaluation of the grafitti component was likewise quite positive. The media expert's evaluation of the readability factor was positive and The media expert's evaluation of the engagement in media programming was equally positive. The media expert's evaluation indicated that the CAI-based learning media on the theme of interaction in ecosystems has been well accepted and has been excellent.

Dianta et al. (2021), who did a similar research including the development of computer-based learning media, discovered that the learning media they developed were applicable for educating high school students in order to enhance student learning performance. According to another prior study by Karuniakhalida et al. (2019), computer-based learning media may assist pupils comprehend the material. According to study conducted by Roza et al. (2017), students report that it is simple to utilize computer-based learning media and that animation on media is extremely engaging, hence aiding in their education.

This research employs a validator who is a specialist in the subject of learning media and ecosystems; hence, it is anticipated that the finished product will be successful for practical learning applications. Some unsuccessful development products often occur because multimedia is not examined by specialists, and some learning materials are created by individuals who do not understand pedagogical concepts or how to create effective educational software (Luik, 2010).

CONCLUSION

Based on the objectives, result and discussion of development CAI based learning media in interactions in ecosystem topic for grade VII previously stated, it can be concluded that the percentage of media assessment achieved 100% for navigation button effectiveness; 90.9% for grafity aspect; 96.4% for readability aspect and for interaction in media program were achieved 95.83%. The percentage of content assessment achieved 89.28% for material aspect; 92.85% for readability aspect; and 95.83% for interaction in media program. Based on the results, it can be concluded that Computer based Learning Media product is feasible to use based on its validity.

For the researcher as a future educator, the results of this study may be utilized as a source of information and feedback to develop understanding about the advantages of employing CAI-based learning media in the teaching and learning process.

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