



## Computer Assisted Instruction Media: Impact to Students Digital Literacy and Learning Outcomes

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### Abstract

This study aims to determine the impact of utilization Computer Assisted Instruction (CAI) based learning media in improving digital literacy skills and student learning outcomes. In this study, data collection used observation sheets to improve students' digital literacy skills through observations of experimental and control groups. It is known that the score of students' digital literacy skills is 81% in the experimental group, while the control group is 67%, meaning that the criteria for students' digital literacy skills in the experimental group are classified as better. In collecting data to determine the effect of media on student learning outcomes, the Pretest Posttest control group design method is used with a pretest, treatment, and posttest pattern. In practice, 2 groups are needed as experimental groups with treatment and control groups without treatment, and observations are made of students' digital literacy skills during learning activities. From the results of the analysis of student pretests and posttests, it is known that there is an increase in scores in the experimental group as indicated by the average N-Gain value of 57.54%, thus the use of CAI-based learning media is interpreted in the category quite effective in improving student learning outcomes. Then based on the results of the one-way anova analysis for the relationship between the improvement of learning outcomes with digital literacy skills in experimental and control groups, it is known that the significance value is  $0.00 < 0.05$ , as well as the results of the post-hoc test with the Turkey method which shows the significance value between digital literacy and learning outcomes is less than 0.05, which means that the use of CAI-based learning media has an influence on digital literacy as well as student learning outcomes. So it can be concluded that the use of CAI-based media has an impact in improving digital literacy skills and student learning outcomes.

### How to Cite

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## INTRODUCTION

Learning Media is used to deliver messages from the source of the message to the recipient of the message to stimulate students' interests, feelings, and learning readiness. Learning Media aims to motivate students and involve students in the learning process (Hamid et al., 2020). CAI-based learning media is a tool that can involve students directly in learning activities. Utilization of CAI-based media in education offers several benefits, such as providing independent learning experiences for students, and the opportunity to get direct feedback (Chen et al., 2018). Besides the benefit of providing a learning experience for students, learning using CAI-based media has the potential to improve students' digital literacy skills.

During the digitalisation era, digital literacy skills are needed to find the vast amount of information available online and how to adapt to the digital era. Adaptation to the digital era is necessary because the digital population is the millennial generation who are tech-savvy and able to use technology extensively, especially on social media (Smith et al., 2018). Digital literacy skills in this present era are very necessary, especially since the changes that occur in this era cannot be stopped, and students as the next generation of the nation must be able to catch up in the digital era through improving digital literacy skills. The presence of CAI-based learning media with features of using digital technology effectively and critically in accessing, evaluating, and creating information, has a great influence in improving students' digital literacy skills, so that students can adapt and (Peng & Yu, 2022).

CAI-based media not only contribute to improving students' digital literacy skills, but have a major benefit in increasing students' learning motivation, resulting in improved student learning outcomes compared to learning without using CAI-based media (Smith et al., 2018). One of the things presented in learning with CAI-based media is an interactive and engaging learning experience that can significantly improve student learning outcomes, by providing direct interaction and virtual simulation for student learning. CAI-based media allows students to actively participate in the learning process, discover new knowledge, and develop critical thinking skills.

In a study pres (Hoerniasih & Nuraini, 2020) ented by (Hamdani et al., 2022) that exploring interactive multimedia can improve students critical thinking skills related to digital

media, when faced with a problem, students are able to analyse and demonstrate critical thinking attitudes by evaluating available sources.

## METHOD

The existence of studies that prove the effect of using CAI-based media in improving students' digital literacy skills, so in this study the application of CAI-based media was carried out on seventh grade students by taking the material of Introduction to Monera, Protista and Fungi which is part of the Classification of Living Things chapter. The model used in CAI-based media is the Tutorial model, where learning is presented sequentially following the steps instructed through the media, and provides feedback on each step that is successfully completed. The research location was carried out at SMPN 5 Kudus by requiring research subjects including two groups, the control group and the experimental group. Students in the control group did not receive treatment, while students in the experimental group received treatment through learning using CAI-based media.

In this research data collection using the pre-test post-test Control Group Design method. Data collection is in the form of student pretest and posttest results as well as observation data on students' digital literacy skills during learning activities. The instruments used were first analysed for validity and reliability, then the data from both treatments were analysed through prerequisite testing in the form of normality and homogeneity tests and then continued testing the N-Gain values from the pretest and posttest results. The effectiveness criteria based on the N-Gain percentage can be seen in Table 1.

**Table 1.** Effectiveness Criteria Based on N-Gain Percentage

N-Gain Percentage (%)	Criteria
< 40	Not Effective
40 – 55	Less Effective
56 – 75	Moderately Effective
>76	Effective

Source: (Arikunto, 2014)

The level of students' digital literacy skills is known from the data on the average percentage of students' digital literacy skills scores with criteria that can be seen in Table 2. Then to determine the effect of CAI-based learning media on improving digital literacy and student learning outcomes, a One-Way Anova test with Turkey HSD

post hoc test was conducted to determine significant differences between digital literacy and learning outcomes of students who were given the treatment and students who were not given the treatment.

**Table 2.** Criteria for students' digital literacy skills

Range of Percentage (%)	Criteria
0-30	Very Less
30-50	Less
51-70	Fair
71-90	Good
91-100	Very good

Source : (Arikunto, 2014)

## RESULT AND DISCUSSION

The study's findings are presented in the form of data analysis of student learning outcomes, including pretest and posttest scores, followed by student digital literacy observation data and the relationship between learning outcomes and digital literacy skills of experimental group students after treatment with control group students. The data was analyzed in multiple phases, including:

### Validity and Reliability Test for Research Instruments.

The study's instrument was initially validated using Pearson Correlation formula (Sugiyono, 2017), which was:

$$r_{xy} = \frac{\Sigma nXY - \Sigma X \Sigma Y}{\sqrt{(n \Sigma X^2 - (\Sigma X)^2)(n \Sigma Y^2 - (\Sigma Y)^2)}}$$

$r_{xy}$  : Pearson correlation coefficient

X : Validity instrument item score

Y : Score of all validity instrument items

To measure reliability, the Cronbach Alpha formula is utilized (Geldhof et al., 2014), which specifies that an instrument is considered reliable if its  $r_{11}$  value is larger than 0.05. The Cronbach Alpha formula for determining the instrument's reliability is as follows:

$$r_{11} = \left(\frac{n}{n-1}\right)\left(1 - \frac{\Sigma \sigma_t^2}{\sigma_t^2}\right)$$

$r_{11}$  = Reliability value

$n$  = Number of students

$\sigma_t^2$  = sum of variance scores for each item

$\sigma_t^2$  = Total variance

Table 3 shows the results of the validity and reliability tests conducted on the question instrument. Given  $N = 34$  students and 15 questions, the  $r$  table coefficient is 0.339 with a 5% significance level, which is then compared to the computed  $r$  coefficient of 0.425. The query is certified valid because the coefficient  $r$  count is bigger than the  $r$  table.

**Table 3.** Results of Validity and Reliability Test of Pretest and Post-test Questions

Type of Test	Index	Criteria
Validity	0.425	Valid
Reliability	0.643	Reliable

The table above shows that the questions match the criteria for reliability questions with high categories. According to Arikunto (2013), the question index with a range of 0.00-0.20 is classified as very low, the question index with a range of 0.21-0.40 is classified as low, the question index with a range of 0.41-0.60 is classified as medium, the question index with a range of 0.61-0.80 is classified as high, and the question index with a range of 0.81-1.00 is classified as very high.

The next phase is to test the validity of the student digital literacy observation instrument. The validity of the digital literacy instrument is determined by the significant value in the correlation test using the Pearson Correlation formula; if the significant value is less than 0.05, the instrument is considered valid. Table 4 shows the results of the validity and reliability tests.

**Table 4.** Results of Validity and Reliability Test of Digital Literacy Instrument

Type of Test	Index	Criteria
Validity	0.425	Valid
Reliability	0.643	Reliable

Table 4 shows that the digital literacy instrument has a significant index less than 0.05, indicating that it is valid. Then, while testing the reliability of digital literacy instruments based on reliability categories according to (Arikunto, 2014), it was shown to be reliable with high reliability criteria. The validated and reliable question and observation instruments for digital literacy can subsequently be utilized in research.

### Descriptive Analysis of Student Learning Outcomes

The next step of analysis is descriptive analysis of the results of Pretest and Posttest scores

in experimental and control groupes. The descriptive analysis results presented in Table 5 show an increase in higher learning outcomes from the experimental group compared to the control group.

**Table 5.** Descriptive Analysis Results of Pretest and Posttest Values of Experimental and Control Groupes

	Min	Max	Average	Std.Dev
Pretest Experiment	33	80	59.00	13.078
Posttest Experiment	53	100	82.97	10.936
Pretest Control	20	87	52.15	17.434
Posttest Control	40	87	62.12	11.916

Based on research from (Wahyuni, 2016) shows an increase in student learning outcomes after the application of CAI-based media, where there is an increase in the average value of learning outcomes which are in the high category. In addition, research conducted by (Habibie et al., 2022) also showed an increase in student learning outcomes using CAI-based media with a tutorial model, where the increase occurred due to the growth of student learning motivation after using learning media.

**Analysis of Student Learning Outcomes**

Analysis of student learning outcomes was conducted to determine the effectiveness of interactive learning media towards student learning outcomes. In this analysis, the average N-Gain value of the Post-test questions of experimental and control group students was tested and presented in Table 6. Before the N-Gain test, the N-Gain score was calculated using the formula:

$$N - Gain = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score} \times 100\%$$

**Table 6.** Test Result of Average N-Gain Val

Group	Statistic	Index
Experi- ment	Mean	57.54
	Std. Deviation	22.07
	Minimum	29.79
	Maximum	100
Control	Mean	17.12
	Std. Deviation	17.93
	Minimum	-22.22
	Maximum	50.75

The interpretation of the N-Gain value based on the effectiveness criteria in Table 1

leads to the conclusion that a CAI-based media utilization on the classification of living things for seventh-grade junior high school students is moderately effective. This is in line with research conducted by (Priskila et al., 2018) which states that CAI-based interactive media is proven effective in improving student learning outcomes. Furthermore, related to how CAI is associated with improving student learning outcomes, research by (De Witte et al., 2015) shows that CAI learning media is effectively used as a tool in improving student learning outcomes, because after being compared between students who learn by using CAI media and students who do not use CAI media, there are significant differences in terms of learning outcomes, where students who are accustomed to using CAI media have higher learning outcomes when compared to students who do not use CAI media.

The effectiveness of using CAI-based media on student learning outcomes is in line with the skills shown by students during learning activities. These skills include the ability to apply digital tools properly, use digital tools wisely, understand and follow the instructions presented, and evaluate content and gather information (Fotutian, 2020).

**Analysis of Students Digital Literacy Skills**

Analysis of students' digital literacy skills obtained by calculating the average conversion from observation scores into percent. A summary of the average percentage of observation results of digital literacy skills can be seen in Table 7.

**Table 7.** Results of Observation of Students' Digital Literacy Skills

Group	Statistic	Percentage(%)
Experiment	Mean	81
	Maximum Score	95
	Minimum Score	65
Control	Mean	67
	Maximum Score	80
	Minimum Score	50

Based on the criteria for digital literacy skills listed in Table 2, it can be concluded that the digital literacy skills of students in the experimental group based on the average shown in Table 7 are in the good category. The abilities of students in the control group, on the other hand, are considered sufficient. According to Joni & Duling (2016) The utilization of CAI-based media helps students improve their digital literacy

abilities, such as competence, application, and digital transformation.

Students in the experimental group are given CAI-based learning media with components that can improve students' digital literacy skills, including the ability to apply digital tools, use digital tools wisely, understand and follow the instructions presented, and evaluate content. Further research by Thanarachataphoom et al. (2022) shows computer-based learning can increase students' digital literacy skills in the fields of accessing, analyzing, creating, and evaluating digital content. Thus, the utilization of CAI-based learning material has an impact on developing students' digital literacy.

**Analyzing the Impact of CAI-Based Learning Media on Digital Literacy and Student Learning Outcomes**

The effect of CAI-based learning media on digital literacy and student learning outcomes was conducted to determine the relationship between the utilization of CAI-based learning media on improving digital literacy and student learning outcomes. The results of the analysis with One-Way Anova are presented in Table 8, then to compare the average between the treatments with the samples of the two groups, a post-hoc test was conducted with the turkey method. The results of the post-hoc test of digital literacy with student learning outcomes are presented in Table 9.

**Table 8.** Results of One-Way Anova Test for Digital Literacy and Student Learning Outcomes

Groups	Sig.
Experiment	.000
Control	.000

The results of the analysis shown in Table 9 are interpreted based on the magnitude of the significant value against the 5% confidence level. For treatments with a significant value of less than 0.05, it can be concluded that there is a significant difference between the two treatments. This difference indicates that the presence of CAI-based learning media has an impact on improving digital literacy and student learning outcomes in the experimental group. The treatment that has a significant value below 0.05 indicates the effect of the treatment on the treatment results (Priskila et al., 2018; Wahyuni, 2016). However, in the control group learning outcomes treatment of digital literacy the control group has a significant value above 0.05 which means there is no significant difference. This is due to the absence of treatment

in the control class that can affect students' digital literacy skills and learning outcomes (De Witte et al., 2015).

**Table 9.** Results of Post-hoc Test for Digital Literacy and Student Learning Outcomes

Treatment	(J) Treatment	Sig.
Learning Outcomes 1	Learning Outcomes 2	.000
	Digital Literacy 1	.032
	Digital Literacy 2	.000
Learning Outcomes 2	Learning Outcomes 1	.000
	Digital Literacy 1	.000
	Digital Literacy 2	.142
Digital Literacy 1	Learning Outcomes 1	.032
	Learning Outcomes 2	.000
	Digital Literacy 2	.000
Digital Literacy 2	Learning Outcomes 1	.000
	Learning Outcomes 2	.142
	Digital Literacy 1	.000

\* 1 = Experiment Group  
2 = Control Group

**CONCLUSION**

Based on the results of the discussion above, it is known that there is an increase in digital literacy skills and student learning outcomes from the use of CAI-based Learning Media with a Tutorial model on Classification of Living Things material for class VII. This is indicated by the results of observations during learning activities that the criteria for students' digital literacy skills are classified as good. Then, students' learning outcomes are also known to increase with an N-Gain value of 57.54%, indicating that the treatment given is effective enough to improve students' learning outcomes. As for the relationship between digital literacy skills and student learning outcomes in the 2 treatment groups, it shows that there is a significant difference between digital literacy and learning outcomes of the experimental and control groups. This shows that the use of CAI-based media has an effect on improving digital literacy skills and student learning outcomes.

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