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Application of Cybergogy Assisted E-Module to Train Digital Literacy: Studies in Junior High School Students

Novitasari Ramadhani[1], Hasan Subekti[2]
Faculty of Mathematics and Natural Sciences, Universitas Negeri Surabaya, Indonesia
E-mail: novitasariramadhani.21026@mhs.unesa.ac.id[1], hasansubekti@unesa.ac.id[2]

Abstract

This study aims to describe the influence of the application of e-module-assisted cybergogy to train students digital literacy. The development of information technology with the industrial revolution 4.0 in the era of digital society 5.0 is very important to train digital literacy. The learning process is hampered due to low interest in reading and literacy, as evidenced by the low results of the 2022 PISA survey. The cognitive results of the daily test showed that only 50% of students completed using the lecture learning method and printed teaching materials. This research is a type of experimental research with a quasi-quantitative research method. This study uses a pre-experimental design experiment design in the form of a one-shot case study design. This research is located at SMP Negeri 1 Bagor. The source of the data is 32 students in class VIII-D. Data on students digital literacy skills were obtained from posttest scores. The research instrument used is a digital literacy ability test. This study uses data analysis techniques in the form of a descriptive statistical test method. The results of the study show that the application of cybergogy assisted by e-modules is effective in training students digital literacy.

Keywords *Cybergogy, E-Modul, Digital Literacy.*

INTRODUCTION

Technological developments in line with the industrial revolution 4.0 are very important to support the technology industry in the digital era 5.0. In that era, it was influential in various fields, one of which was in the field of education. Conventional education is beginning to adapt to the digital world. Students can access through learning resources, the internet, and learning resources. This is in accordance with the concept of learning from *cybergogy* according to Wang & Kang (2006) *cybergogy* is a framework that aims to create online learning that involves offering learning without space and time limitations (Mardian et al., 2024; Ramadhan et al., 2022). Referring to this statement, *cybergogy* learning is an educational method in the era of learning digitalization with the use of information and communication technology empowerment facilities that function for the cognitive, social, and emotional progress of students to create engaged online learning (Ramadan et al., 2022)

Digital literacy skills are currently very important to practice. The challenges of the complex world of education are developing along with the increasing demands of digital literacy, which must be mastered by teachers and students in order to compete in the world of work (Mayuni et al., 2022). After the application of the independent curriculum in the 2022/2023 school year, there are new challenges, namely online and hybrid learning because the pandemic has developed digital literacy skills (Dhiemas et al., 2024). Digital competence today is very important, there is urgency in the development of technology-based learning. The application of the concept of digital literacy in learning, namely educators must create

learning with a measurable and directed climate accompanied by the use of technology as a medium and supporting tool in learning (Septianingrum et al., 2022).

The use of large digital technology makes internet access very easy to do. Digital technology on the other hand also influences students to access *games*, social media, *online stores*, and music rather than using them to read information on the internet. The cause of the inhibition of the learning process is low interest in reading and literacy (Pratiwi & Indana, 2022). Based on the results of the *2022 Program for International Student Assessment* (PISA) survey, it was explained that Indonesia ranked 69th out of 81 countries with a score of 369. Indonesia's reading score in PISA 2022 decreased to 359 compared to 371 in 2018 (OECD, 2019; OECD, 2023).

Based on the results of interviews with science subject teachers, SMP Negeri 1 Bagor stated that the results of the daily cognitive test of mixed separation material for the 2024/2025 school year showed that only 50% had reached the Minimum Passing Criteria (KKM) for science subjects, namely 70 on a scale of 100. In addition, this material requires mastery of effective and interactive concepts and teaching materials so that it makes it easier for students to understand concepts, applications, and experiments. Therefore, the science learning process is carried out by packaging interesting teaching materials so that students are more active and enthusiastic by using teaching materials in the form of e-modules in science learning.

The results of observations and interviews with science teachers of SMP Negeri 1 Bagor show that there is a problem where the technology empowerment facilities applied are very limited. This affects students digital literacy skills. The low digital literacy of students causes the learning process to be unsuccessful and the learning goals are not achieved. This can cause students to have difficulty understanding information from digital media.

Based on the results of interviews with science subject teachers at SMP Negeri 1 Bagor stated that the learning methods used are still conventional and the teaching materials used are in the form of articles, package books, the internet, and science modules issued by MGMP Sains Nganjuk Regency. Print teaching materials have shortcomings, namely they cannot present movements and materials presented in a linear manner (Prastowo, 2018; Wahyuni et al., 2022). The teaching materials used are not in demand by students because of their monotonous nature, so they require innovation in teaching materials, namely e-modules. In addition, one way to integrate digital literacy skills in learning is by teachers using teaching materials based on digital technology (Sa'adah et al., 2020; Wahyuni et al., 2022). In addition, science learning at SMP Negeri 1 Bagor has also not implemented e-modules for students.

E-modules are teaching materials that are packaged electronically (Yuliana et al., 2023). E-modules present *online study* guides, links to videos and material articles, and quizzes. Research conducted by (Pratiwi & Indana, 2022), stated that the use of e-modules was effective in training students digital literacy skills with 100% student learning outcomes and a positive response of 91.22%. In addition, another study conducted by (Khoirunisa, 2023), explained that the use of e-modules can channel learning messages well, as evidenced

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by student learning outcomes with an average *posttest score* of 85 in the experimental class and 69 in the control class. In addition, the use of *android-based mobile learning modules* is effective in improving students digital literacy with an average N-gain score of 0.45 in the medium category and an average questionnaire response percentage of 97% in the very positive category (Wahyuni, S. et al., 2022). Therefore, e-modules can train students digital literacy skills with learning activities in the form of online quizzes, articles relevant to the material, and online study guides.

The difference between this study and the previous research is that there are still few who research e-modules on mixed separation materials, so in this study they use mixed separation materials. In addition, this study emphasizes the application of *cybergogy* with the help of e-modules while other studies focus more on e-modules only. Not only that, this study also trains students digital literacy skills as measured by *posttest questions*.

Based on the above background, a research was conducted with the research title "Application of *Cybergogy* Assisted by E-Module to Train Digital Literacy of Junior High School Students". Based on the description of the background of the problem, the problem formulation "What is the effect of the application *of cybergogy* assisted by e-modules to train students digital literacy?" and the purpose of the research "Describe the effect of the application *of cybergogy* assisted by e-modules to train students digital literacy".

METHOD

This study uses a quasi-quantitative approach with a *pre-experimental design* experiment design in the form of *a one-shot case study design*. to find out the response of students after treatment (Diraya et al., 2021). This research is determined based on the purpose of the research, which is to describe the impact of the application of *cybergogy* assisted by e-modules to train students digital literacy.

Table 1. Research Design *One-shot case study design*

Treatment	*Posttest*
X	O

Source: Sugiyono (2017)

Information:
X = Learning with the application of *cybergogy* assisted by e-modules
O = Posttest score

The e-module that has been developed is piloted on 32 students in grades VIII-D SMP Negeri 1 Bagor for the 2024/2025 school year with *a cluster random sampling* technique. According to Lestari, et al. (2017) stated that *cluster random sampling* is a regional sampling technique that aims to determine a sample if the object or subject or data source being studied is very broad (Handayani & Muhammadi, 2023). The test method was carried out on the 32 students, before and after the application *of cybergogy* assisted by e-modules. This research was conducted at SMP Negeri 1 Bagor which is located in Banarankulon Village, Bagor District, Nganjuk Regency. This study uses validated digital

literacy *ability posttest* questions and teaching tools in the form of teaching modules and e-modules that have been validated. Data on the results of students working on digital literacy *posttest* questions was collected through answer sheets after being treated for two meetings in October 2024. Students are given clear questions and instructions on how to answer the *digital literacy* skills posttest questions.

The data analysis technique used in this study is a quantitative descriptive technique. The value of students digital literacy skills is summed up in each aspect, including aspects *of searching, hypertext,* content evaluation and knowledge preparation. Then the average value is sought. The average score of *the posttest* and the reference score or KKM will be compared. Analyze the results of students mastery of concepts by looking at the results of *the posttest*. The results of *the posttest* score are calculated using the following formula (Pratiwi & Indana, 2022):

$$Knowledge\ score = \frac{Total\ scores\ obtained}{Maximum\ score}\ x\ 100$$

Students are declared complete if they get a *posttest score* with a score of ≥ 70 which is the KKM score for science subjects at SMP Negeri 1 Bagor. The indicator is declared complete by the researcher if the average assessment is ≥ 70%. The guidelines for the value of the digital literacy category, adapted by (Ayun, 2021) in Arikunto (2013) are as follows.

Table 2. Guidelines for Digital Literacy Value Categories

Score (x)	Category
x ≥ 80	Very High
60 < x ≤ 80	High
40 < x ≤ 60	Medium
20 < x ≤ 40	Low
X ≤ 20	Very Low

The results of achieving digital literacy skills will be analyzed using a data normality test using the *Kolmogorov-Smirnov* and *Shapiro-Wilk* formulas, hypothesis tests using *the one sample t test* formula. The normality test and hypothesis test were processed using *the SPSS version 25.0 for windows* program. If the data is abnormal, then it can be tested with *a wilcoxon* test.

RESULTS AND DISCUSSION

The achievement of digital literacy in each aspect was obtained from *the posttest*. The achievement of digital literacy in each aspect can be seen in **Figure 1** below.

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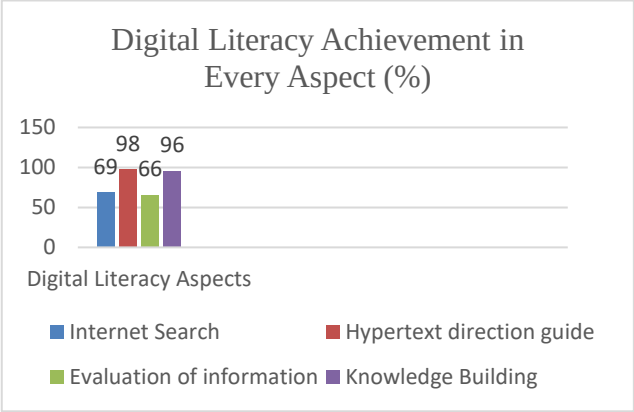

Figure 1. Achievement of Digital Literacy in Each Aspect
Source: Primary Data

Based on Figure 1, it can be seen that the achievement of digital literacy in each aspect of the *posttest* results in different percentages. The average percentage of the overall achievement of each aspect of digital literacy in the *posttest* was obtained at 82% which was categorized as very high. The achievement of the lowest aspect in the *posttest*, namely the evaluation of information content with 66% which is categorized as high, while the achievement of the highest aspect lies in the *hypertext direction guide* aspect with a percentage of 98% which is categorized as very high.

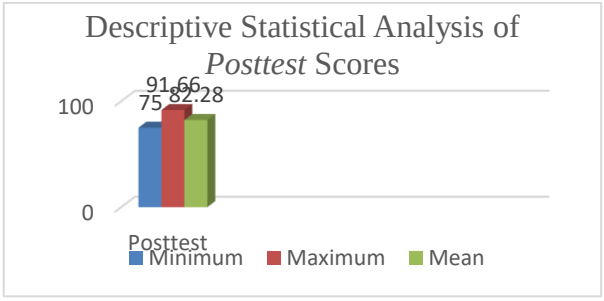

Figure 2. Diagram of descriptive statistical analysis of *posttest scores*
Source: Primary Data

Based on the results of the descriptive analysis that has been described in Figure 2, it shows that the average *posttest* score is 82.28 with a minimum score of 75.00 and a maximum score of 91.66. These values cannot be used as a conclusion to see significant differences, so it requires statistical inferential testing, namely hypothesis testing, namely using *a one-sample t-test.*

Before conducting a hypothesis test, the data that has been obtained needs to be carried out a prerequisite test for data analysis, namely the normality test. A normality test is used that aims to see the normality or abnormality of the data. Based on a small sample size or no more than 100 samples, the researcher used the *Shapiro-Wilk normality test* with a significant level α = 0.05. If the significance is above 0.05, it means that there is no significant difference between the data tested and the standard normal data or the normally

distributed data in another sense, that is, the data tested for normality is no different from the standard normal. The following are the results of the calculations obtained.

Table 3. Normality test

Data Type	*Shapiro-Wilk*			Information
	Statistic	df	*Sig.*	
Posttest	0.413	32	0.000	Abnormal

Based on **Table 3**, the results of the data normality test obtained in the *posttest* data are not normally distributed with a value of sig. < 0.05, which is 0.000. So, it can be concluded that the data is not normally distributed. If the results of the data distribution obtained are abnormal, then the data cannot be parametrically tested with the *one sample t-test* but tested through non-parametric statistical tests, namely the *Wilcoxon Sign Rank Test* (Mardiah et al., 2024; Navila & Toharto, 2023).

Decision making in hypothesis testing can be known by looking at a comparison of values from probability *Asymp. Sig (2-tailed)* at the level of significance α = 0.05. The data acquisition is shown in the following table.

Table 4. *Wilcoxon* Test *Rank*

		N	**Mean Rank**	**Sum of Rank**
Digital Literacy *Posttest* Results – Reference Score/KKM	Negative Ranks	0^a	.00	.00
	Positive Ranks	32^b	16.50	528.00
	Ties	0^c		
	Total	32		

a. Digital Literacy *Posttest* Results < Reference Score/KKM
b. Digital Literacy *Posttest* Results > Reference Score/KKM
c. Digital Literacy *Posttest* Results = Reference Score/KKM

Based on **Table 4** of the results of the *Wilcoxon* Test *Rank,* it was found that the negative difference obtained from digital literacy skills between the reference score of 70 and the *posttest*, which was 0 on the N value, the average rating, and the total ranking. This states that between the reference score and the results of the digital literacy *posttest*, there is no decrease in the results of students digital literacy skills after learning with the application of *cybergogy* assisted by e-modules. Meanwhile, the positive difference obtained, namely students digital literacy skills, increased by 32 students overall in the *posttest* from the reference score. The average rating listed is 16.50 and the number of ratings is 528.00. There was no similarity between the results of students digital literacy skills in the reference score and the digital literacy *posttest* score. Therefore, it can be concluded that

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there are 32 students who experienced an increase in digital literacy skills from the reference score with the *posttest* score after the application of *cybergogy* assisted by e-modules.

Table 5. *Test Statistics*[a]

Test Statistics[a]

	Digital Literacy *Posttest* Results – Reference Score/KKM
Z	-5.210^{b}
Asymp. Sig. (2-tailed)	.000

a. *Wilcoxon* Signed Ranks Test
b. Based on negative ranks

Based on **Table 5** of the *Wilcoxon* test statistics, *the Asymp* value was obtained. *The Sig (2-tailed)* in the *Wilcoxon* test result is 0.000 which is less than the significance value α = 0.05 (0.000 < 0.05) which results in H_o being rejected and H_1 being accepted. This indicates that there is a significant average difference between the reference score and the results of the students digital literacy *posttest* in the application of *cybergogy* assisted by e-modules.

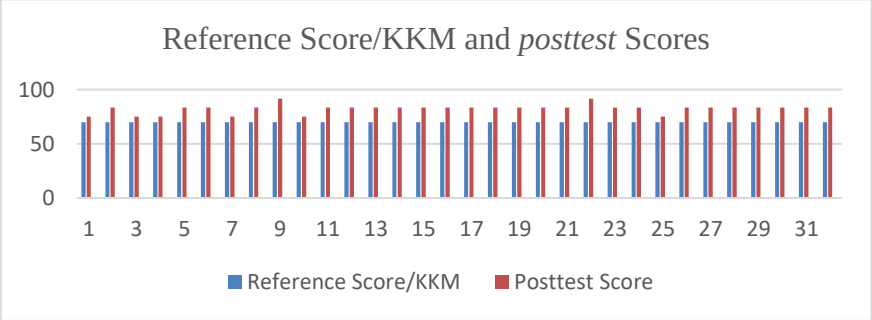

Figure 3. Diagram of reference value/KKM and *posttest* score
Source: Primary Data

Based on Figure 3 of the diagram of the reference score/KKM and *posttest* scores, it can be reviewed that all students get a significant influence. The *posttest* score obtained by students is higher than the reference score/KKM which shows that the application of learning with the application of *cybergogy* assisted by e-modules is able to have an influence on students digital literacy skills.

Interpretation of Key Findings

Based on the hypothesis test with the *Wilcoxon* test, it is stated that the value of*Asymp. Sig (2-tailed)* in the *Wilcoxon* test result is 0.000 which is less than the significance value α = 0.05 (0,000 < 0,05) which results in H_o rejected and H_1 accepted. This indicates that there is a significant average difference between the reference score and the results of the students digital literacy *posttest* in the application of *cybergogy* assisted by e-modules. This is in line with research (Mardiah et al., 2024) which shows that the use of e-modules in

learning with a significance value of 0.000 < 0.05 on the *Wilcoxon* test improves student learning outcomes and is effectively used in learning. In addition, other research from (Budihardjo & Prapanca, 2023; Rofi'i et al., 2022; Rohmayanti & Hidayah, 2023) also produced a value *PvalueasympSig (2-tailed)* as 0,000 < 0,05. Therefore, the use of e-modules in *cybergogy* learning can affect the extent of students digital literacy skills towards lessons.

Comparison with Previous Studies

The use of e-modules in learning with the application of *cybergogy* has been proven to have an influence on students digital literacy skills. According to (Astuti et al., 2024; Lestari et al., 2024; Maulidiyah et al., 2024; Muhsam et al., 2024) the application of e-modules can train digital literacy skills. Referring to the significant average difference between the reference score and *the posttest* score in the application of e-module-assisted *cybergogy*, there is an influence on the application of e-module-assisted *cybergogy* in class VIII-D at SMP Negeri 1 Bagor. This is in line with other research conducted by (Khoirunisa, 2023), explaining that the use of e-modules can channel messages learning well, as evidenced by the average *posttest* score of the experimental class is better than that of the control class. Several other studies (Alyspa et al., 2022; Rahman et al., 2023; Siswanto et al., 2022) stated that students must master digital literacy skills considering that all areas of life have used various technological products.

Limitations and Cautions

Based on the results of observations in the field, it is stated that there are several obstacles in the field. According to (Muktamar et al., 2023), researchers must make decisions in dealing with them. The problem in this study is that a student does not carrying a mobile phone. The solution, namely before learning begins, the researcher has provided a *handphone* If there are students who do not carrying a mobile phone. Another obstacle is that some students have difficulty accessing the link to the *posttest* questions. The solution is that the researcher directs his students to use *Google Lens* or a scanner to copy the link. *Google Lens* is used to scan and copy links (Ruhaliah et al., 2022). Therefore, researchers can solve problems by providing solutions and as a form of reference for further research.

Recommendations for Future Research

Future research focuses on overcoming limitations by providing backup devices in the form of mobile phones before learning begins to ensure all students have equal access to technology. In addition, to face difficulties in accessing the links in the questions, you can use *Google Lens* technology or a similar scanner. Researchers take these steps to improve the success of research in facing obstacles in the field and make an important contribution to future research.

CONCLUSION

This study aims to describe the influence of the application of e-module-assisted *cybergogy* to train students digital literacy. The findings showed that the *results of the*

students posttest were in the form of an average score of 82.28, a minimum score of 75.00, and a maximum score of 91.66 with a level of complete achievement. Test Statistics *Wilcoxon* test, obtained a score *Asymp. Sig* (*2-tailed*) is 0,000 < 0.05, Highlighting that digital literacy is currently a skill in using digital media is very important to master. In particular, *cybergogy* implemented with the help of e-modules can contribute to improvement and innovation using digital media in learning. In addition, certain limitations must be considered, such as a student who does not carry a mobile phone. Future research should focus on identifying future directions or opportunities to build on studies that have the potential to improve understanding of this research.

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