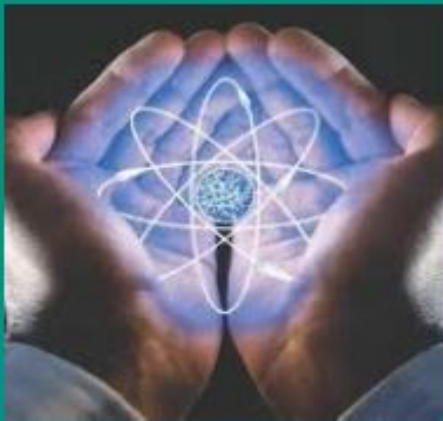


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By Universitas Muhammadiyah Sidoarjo

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Student Engagement and Achievement with a Digital Literacy E-Module

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Abstract

General Background: Digital literacy has become essential for students to navigate, evaluate, and create information in today's technology-driven learning environments. **Specific Background:** At MTsN 3 Langkat, class VIII Informatics students traditionally rely on teacher-led instruction, with limited opportunities to independently source and transform information. **Knowledge Gap:** Despite the proliferation of e-learning tools, little is known about how digital literacy-based e-modules affect both learner motivation and academic performance in middle-school Informatics. **Aims:** This Classroom Action Research (CAR) investigation examined whether implementing a digital literacy-focused e-module could enhance motivation and learning outcomes among eighth-grade Informatics students in the 2024/2025 academic year. **Results:** Over successive CAR cycles—comprising planning, implementation, observation, and reflection—students demonstrated notable gains in engagement and achieved higher assessment scores. **Novelty:** This study uniquely combines e-module design with collaborative knowledge construction through student-driven information sourcing. **Implications:** Findings suggest that integrating digital literacy frameworks into e-module development can foster deeper learner engagement and improve Informatics achievement in similar educational contexts.

Highlights:

- Emphasizes digital literacy integration through self-guided e-modules.
- Utilizes cyclical CAR stages (planning, action, observation, reflection).
- Demonstrates measurable gains in both motivation and academic performance.

Keywords: E-Module, Digital Literacy, Classroom Action Research, Student Motivation, Learning Outcomes

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Introduction

In today's digital era, digital literacy has become an essential skill that enables individuals to navigate the online world safely, intelligently, and productively. Digital literacy is a derivative of the definition of 'literacy' and 'digital'. Literacy here is interpreted as the ability to read and write. Meanwhile, digital means a reading and writing format that is on a computer, laptop or other technological device. The complete meaning of digital literacy is the ability to read and write that can be done by operating a technological device in digital format [1]. Meanwhile, another opinion is that digital literacy is an individual's attitude, ability and connection when using digital technology or when accessing a communication tool, then managing and integrating which is then analyzed and evaluated the information obtained to build new knowledge that is able to create and communicate with the opinions of others so that it can be achieved effectively [2].

Digital literacy is the ability to obtain, understand and use information from various sources in digital form [3]. With strong digital literacy, people can avoid misinformation and hoaxes, and make well-informed decisions based on accurate and reliable information. It also helps users stay protected from various online threats, allowing them to engage in digital activities with greater security and confidence.

Digital literacy is not just the ability to use software or run digital devices, but digital literacy encompasses a variety of interrelated cognitive, sociological, and emotional skills that users need to be able to play an appropriate role in the digital environment [4].

Digital literacy empowers individuals to create, communicate, learn, and work more effectively, while also making positive contributions to society. By understanding proper online communication ethics and maintaining a responsible digital footprint, individuals can build a positive self-image, steer clear of potential issues, and help foster a healthier and more positive digital environment for everyone.

The subject of Informatics plays a key role in supporting digital literacy, which is defined as the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital technology for both work and entrepreneurship. It encompasses skills, ethics, culture, safety, and digital balance across cognitive, technical, and socio-emotional dimensions.

The characteristics of Informatics subjects are implementing engineering process practices in the learning process and principles of Informatics science by integrating: (a) Computational thinking; (b) Digital Literacy enriched with the concepts of Information and Communication Technology, Computing Systems, Computer Networks and the Internet, and the Social Impact of Informatics on individuals and society as a life skill in the digital era; (c) Data Analysis, namely data processing that focuses on analysis of computation-based data; and (d) Algorithms and Programming to work in producing creative digital works or programs to help solve individual or societal problems [5].

Informatics education also enhances students' abilities to realize their potential in the digital world through digital competence, ethical behavior online, and a Pancasila-based digital culture. Ultimately, it aims to help students live safely and maintain a balanced life in the digital age.

The researcher seeks to introduce a digital-based e-learning module. The researcher believes that a digital-based e-learning module aligns well with the characteristics of the Informatics subject. Digital learning in Informatics refers to a teaching approach or procedure that primarily utilizes technology-based learning activities, where the outcomes—namely, the information obtained—serve as the core material for the learning process.

The development of research discussing digital literacy can be seen using the Vos Viewer application. First, collect 200 journal articles on the topic of digital literacy using the Publish or Perish application, then visualize the relationship between hundreds of journal articles using the Vos Viewer application and obtain the results in Figure 1 below.

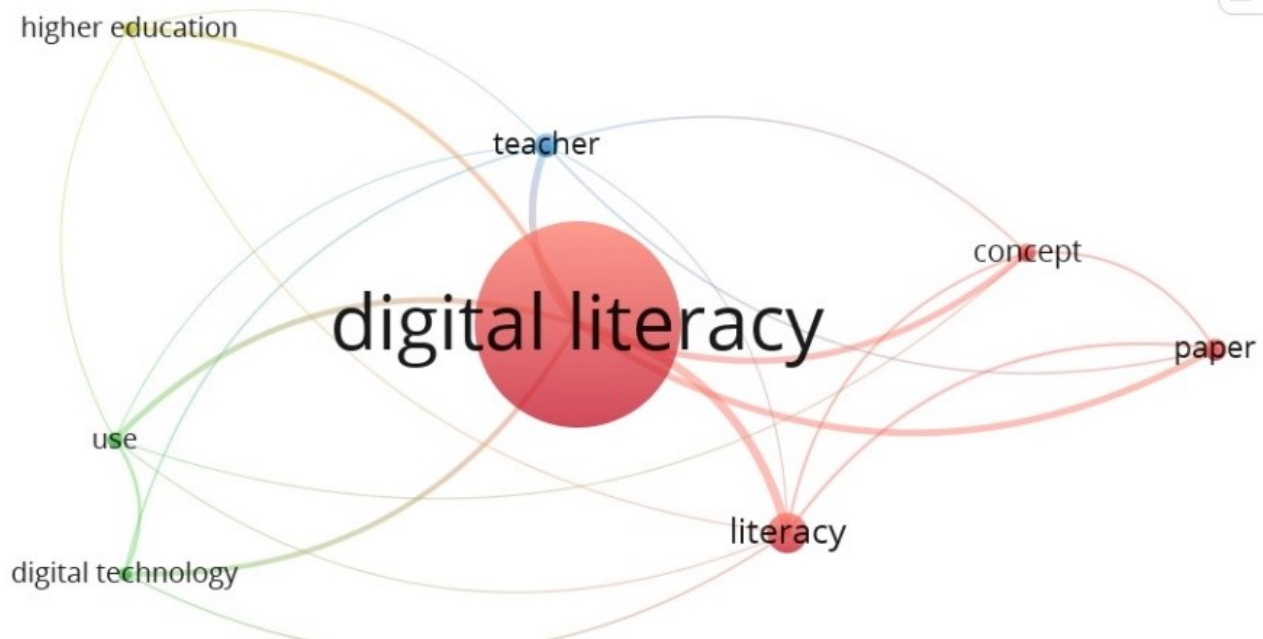


Figure 1. Visualization of the Relationship between Research on Digital Literacy

In the figure, it can be seen that the topic of digital literacy has been researched quite a lot, but research on digital literacy and its relationship to use is still little or rarely researched. Therefore, research on the topic of digital literacy that is related to its use is interesting to study.

Here are some differences between previous research and current research regarding digital literacy-based e-modules in the following table.

Aspect	Previous Research	Current Research
Research Focus	Generally focused on the effectiveness of using e-modules in general in learning various subjects.	Focus on digital literacy-based e-modules specifically in Informatics learning
research purposes	To improve the effectiveness of learning and student independence in general.	To improve student learning motivation and learning outcomes in Informatics learning through a digital literacy approach.
Digital Literacy Concept	Not yet a main focus, most only discuss digital media without emphasizing strengthening students' digital literacy.	Integrate the concept of digital literacy comprehensively in e-modules to strengthen students' digital competence.

Table 1. Differences between previous research and current research

According to Silalahi et al., (2022), this digital learning model employs technological tools such as mobile phones, laptops, computers, and other digital devices commonly used in the teaching and learning process facilitated by educators [6]. According to Riana (2007), In addition to conceptual understanding, Informatics education also aims to develop practical skills in the use of information technology, problem-solving, programming, and related areas [7].

Based on these perspectives, it can be concluded that the use of digital technologies—such as smartphones, computers, software or applications, the internet, and other tools—is essential in Informatics education. Students develop skills in utilizing information and communication technologies, while teachers play a key role in facilitating the learning process by delivering materials, providing examples, and offering opportunities for students to practice using both software and hardware. This leads to the development of practical competencies in information technology usage, problem-solving, programming, and more.

Based on observations during teaching and learning activities at MTsN 3 Langkat, particularly in Grade VIII, it was evident that students' motivation to participate in the learning process was still low. This could be seen from the students' lack of enthusiasm during classroom activities. The low level of motivation resulted in less-than-optimal learning outcomes, with many students scoring below the established Minimum Mastery Criteria (KKM), which is

set at 76.

According to Dale (1969) based on the cone of experience theory, students can benefit from concrete learning activities, namely direct experience by directly relating to objects, events, or real objects so that students actively work alone in solving problems based on the learning objectives set [8]. Meanwhile, at MTsN 3 Langkat there are no effective media, learning modules or learning materials to improve student understanding through direct experience that can be useful during the learning process and have an impact on student learning outcomes.

In response to this issue, the researcher introduced a digital literacy-based e-module. The researcher believes that the use of a digital literacy-based e-module aligns well with the characteristics of Informatics learning and there has been no previous research that specifically examines the effect of digital literacy-based e-modules on motivation and learning outcomes of Informatics at MTsN 3 Langkat. According to Sofa & Zahra (2022), an e-module is a digital teaching material designed to be effective and efficient, focusing on enhancing students' independence in the learning process [9]. According to Tambunan & Tambunan (2023), e-modules make the learning process more engaging, as they can include images and instructional videos that help students understand the subject matter, supported by learning guides and systematically arranged explanations [10]. According to Romayanti et al., (2020), The use of e-modules as learning materials also serves as an alternative to printed books or hardcopy materials without diminishing their role as a source of information. These e-modules can be utilized both in the classroom and outside [11].

Based on the opinions of these experts, it can be concluded that e-modules are digital open materials developed to facilitate learning and increase student motivation. E-modules provide study guides, game tools, and videos that can be accessed boldly and are suitable for learning environments inside and outside the classroom. The novelty of this study lies in the use of digital literacy-based e-modules that have not been widely applied in Informatics learning at the madrasah level, especially at MTsN 3 Langkat.

Method

This research is a Classroom Action Research (CAR) conducted at MTsN 3 Langkat located at Jl. Tanjung Pura No. 10, Wampu District, Langkat Regency. The subjects of this study were 32 students in class VIII-1. CAR was conducted for one month, starting from February 3, 2025 to February 28, 2025.

The method used in this study is Classroom Action Research which is conducted in two cycles. The research procedure refers to a series of stages from the beginning to the end of the research. Each cycle consists of four stages, namely: planning actions, implementing actions, observing results, and reflecting on results. The purpose of CAR is to improve and enhance the quality of learning through appropriate teaching methods according to the problems and development levels of students [12]. Classroom Action Research conducted by teachers will provide benefits, namely being able to innovate learning, teachers can improve their reflective abilities and be able to solve problems in learning that arise [13].

Results And Discussion

A. P re-cycle S tage

In the pre-cycle stage, the researcher took data on student learning outcomes before the action. The data taken was the value data at the previous meeting that described student learning outcomes. Based on the documents owned by the informatics subject teacher in class VIII-1, it was found that the average value obtained by the class was only 67 with a learning completion of 48%.

Based on observations, teachers still use conventional methods or general methods that were previously carried out such as lectures and direct assignments. These methods often do not involve students actively, so that student participation, motivation, and understanding may be low. Students who are passive and not interested in the material so that learning feels monotonous due to limited interaction and minimal use of technology.

B. Cycle 1 - Meeting 1

Before the learning begins, the teacher shares a link to the e-module through a chat group and asks students to read the introduction section regarding the use of the e-module. The teacher also provides a trigger question for learning activity 1.

The teacher guides students to start learning activity 1, by directing them to the problem, forming groups, analyzing a case using the features available on the e-module, presenting discussion results, conducting simulations, completing a digital quiz at the end of the activity that immediately provides automatic feedback, sending mini-project assignments, and providing online consultation time for students who experience technical

difficulties or creative ideas.

Observations were conducted by observers, namely fellow teachers from the same group who observed the teacher's activities as researchers in carrying out learning activities with instruments that had been prepared in advance. Then the researcher conducted observations of students during the learning activities carried out at each meeting. From the results of the observer's observations, it was found that the teacher still seemed to have less control over the class when initially forming groups and conveying the relationship between the problems used as student worksheets and the material being taught. Some students seemed to still not understand how the implementation of the learning that would be carried out.

The teacher who observed the students saw the students' curiosity about the problems presented to their respective groups. Some students seemed enthusiastic to discuss the existing problems, but some others still did not seem to have grown their curiosity about the material and problems discussed in their groups. The teacher came to each group's table and asked about their condition in the discussion, some groups asked questions about their problems, but others still tended to be passive in asking and discussing. During the group presentation at the first meeting, only students who had been known to be active participated in asking questions and input.

No	Observed Aspects	Total 32 Students			
		Visible	%	Not Visible	%
1	Diligent	10	31,25	22	68,75
2	Active in solving problems	8	25	24	75
3	Fun to learn	15	46,87	17	53,12
4	Focus	8	25	24	75
5	Not bored	10	31,25	22	68,75
6	Enthusiastic	12	37,5	20	62,5
7	Active in expressing opinions	8	25	24	75
8	Self-confident	5	15,62	27	84,37
9	Not easily give up	5	15,62	27	84,37
10	Dare to ask	10	31,25	22	62,85
	Classic Total Motivation	91	28,43	2 29	7 1,56

Table 2. Observation Results of Student Motivation Cycle 1 Meeting 1

The difference in growth rates between these aspects shows that group activities tend to increase student activity more quickly, while aspects that demand individual initiative in public spaces, such as asking questions, require more time and a more sustainable approach. Therefore, further interventions need to be carried out in creating a psychologically safe classroom climate, so that students feel comfortable expressing their questions and opinions.

C. Cycle 1 - Meeting 2

Students began to feel that they were really being noticed by the teacher in the learning process. Some students showed a change in attitude. When the teacher rearranged the sitting position according to the group, students were more alert in moving. In the problem-solving discussion, students appeared to be more active in the discussion. Students returned to discussing with their groups to solve the problems faced by their groups. There were 2 groups that asked the teacher a lot of questions about the problems they had to solve. So that it took up quite a lot of the teacher's time to help and answer questions from their groups. After that, the teacher invited several groups to present the results of the discussion in front of the class by bringing and displaying the group's name in front of the class to show their existence as a group of presenters. Furthermore, the results of the observation can be seen in the following table:

No	Observed Aspects	Total 32 Students			
		Visible	%	Not Visible	%
1	Diligent	14	43,75	18	56,25
2	Active in solving problems	10	31,25	12	37,5
3	Fun to learn	18	56,25	14	43,75
4	Focus	10	31,25	12	37,5

5	Not bored	15	46,87	17	53,12
6	Enthusiastic	18	56,25	14	43,75
7	Active in expressing opinions	15	46,87	17	53,12
8	Self-confident	10	31,25	22	62,85
9	Not easily give up	8	25	24	75
10	Dare to ask	15	46,87	17	53,12
	Classic Total Motivation	1 33	41,56	1 67	5 2,18

Table 3. Observation Results of Student Motivation Cycle 1 Meeting 2

In the first meeting, some students tend to be passive because they are not yet used to the new learning approach. However, in the second meeting and after experiencing small successes (such as answering questions correctly or being active in groups), their confidence begins to grow.

Teachers create a more conducive classroom atmosphere by appreciating the smallest student participation, giving positive and constructive feedback, avoiding assessments that make students afraid of being wrong. This supportive learning environment provides a sense of psychological safety, so that students are more free to be actively involved and express themselves in learning.

From the table above which describes the state of students' learning motivation in cycle 1, it can be seen that there was an increase in motivation due to students' activities using digital literacy-based e-modules and teachers who directed students in the learning process.

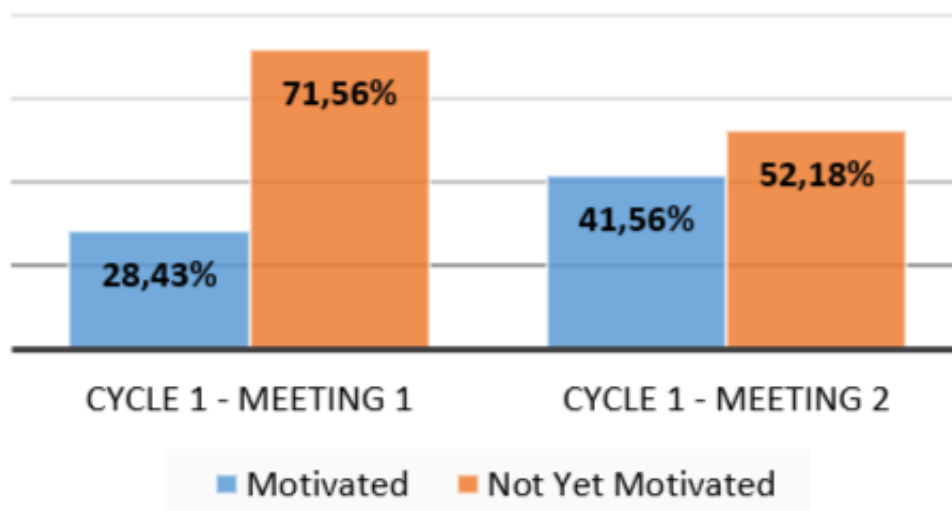


Figure 2. Learning Motivation Observation Diagram Cycle 1

At the end of each cycle, the teacher gives a written test to students to measure student learning outcomes. The test given is in the form of multiple choice questions consisting of 10 questions and is done by students immediately after the end of cycle 1. After that, the teacher checks the test results and makes conclusions and tabulates the test result data. Student learning outcomes in cycle 1 were 2 students getting a score of 90, 13 students getting a score of 80, 7 students getting a score of 70, 4 students getting a score of 60, 5 students getting a score of 50 and 1 student getting a score of 40. So the classical average score is 70. Where the KKM score for informatics subjects for Class VIII MTsN 3 Langkat which is set is 76. This shows that the average class score has not exceeded the KKM score that has been set.

At the end of cycle 1, the teacher distributed questionnaire sheets to students to see student motivation during learning using digital literacy-based e-modules. The teacher asked 10 questions on the questionnaire where each question was based on indicators or characteristics of high learning motivation as compiled. The results of the student motivation questionnaire in cycle 1 above show that the number of students who were motivated during

learning was 41,56% while students who were not motivated averaged 52,18%.

D. Cycle 2 - Meeting 1

In cycle 2, meeting 1, the teacher continues to observe each student activity to see whether or not the characteristics of high learning motivation are visible from the students. There is a change in students' learning attitudes in meeting 1 of cycle 2, namely that students are more serious and in solving the problems given to their groups. Furthermore, during the group presentation session, many students competed to submit responses, as seen from the large number of students raising their hands. For meeting one of cycle 2, the teacher again observed students' learning activities to obtain data on the state of student motivation according to the previously prepared instrument.

No	Observed Aspects	Total 32 Students			
		Visible	%	Not Visible	%
1	Diligent	21	65,62	11	34,37
2	Active in solving problems	24	75	8	25
3	Fun to learn	20	62,5	12	37,5
4	Focus	18	56,25	14	43,75
5	Not bored	17	53,12	15	46,87
6	Enthusiastic	20	62,5	12	37,5
7	Active in expressing opinions	21	65,62	11	34,37
8	Self-confident	17	53,12	15	46,87
9	Not easily give up	17	53,12	15	46,87
10	Dare to ask	20	62,5	12	37,5
	Classic Total Motivation	195	60,93	125	39,06

Table 4. Observation Results of Student Motivation Cycle 2 Meeting 1

From the table above, it can be seen that the state of student learning motivation is 195 (60,93%), while the number of students who are not yet motivated is 125 (39,06%). In Cycle 2, there was a significant improvement in almost all aspects observed compared to Cycle 1. Based on the reflection of Cycle 1, the teacher made improvements, namely optimizing group work, by ensuring that each member gets an active role. This improvement made students better understand the tasks that had to be completed, so that they became more confident in participating.

E. Cycle 2 - Meeting 2

From the results of teacher observations in the 2nd meeting of cycle 2, it can be seen that more and more students are enthusiastic in the problem-solving discussion. Students enjoy arguing and trying to show their activeness. Given the limited implementation time, not all students have the opportunity to submit questions or responses. However, the author still gives appreciation for the activeness of students who show an increase in student learning motivation. Furthermore, the results of the observation can be seen in the following table.

No	Observed Aspects	Total 32 Students			
		Visible	%	Not Visible	%
1	Diligent	25	78,12	7	21,87
2	Active in solving problems	24	75	8	25
3	Fun to learn	20	62,5	12	37,5
4	Focus	19	59,37	13	40,62
5	Not bored	20	62,5	12	37,5
6	Enthusiastic	25	78,12	7	21,87
7	Active in expressing opinions	28	87,5	4	12,5
8	Self-confident	24	75	8	25

9	Not easily give up	20	62,5	12	37,5
10	Dare to ask	24	75	8	25
	Classic Total Motivation	2 29	71,56	91	28,43

Table 5. Observation Results of Student Motivation Cycle 2 Meeting 2

From the table it can be seen that the achievement of student motivation scores is 229 (71,56%) while the score that is not yet motivated is 91 (28,43%). This shows that in every action using digital literacy-based e-modules there is an increase in student learning motivation.

Because they are already familiar with the learning pattern using digital literacy-based e-modules in Cycle 1, students become more accustomed and feel comfortable in participating in activities. This has a direct impact on improving aspects such as being active in solving problems, daring to ask questions and being able to express opinions. With the support of a conducive learning environment, students begin to leave their comfort zones and show the courage to be more actively involved.

During Cycle 2, teachers provide direct and positive feedback on student participation, both verbally and in writing. This encourages students to continue to improve their performance, because they feel appreciated and clearly directed.

The improvement in aspects observed in Cycle 2 is the result of a combination of improving learning methods, increasing student comfort in the learning process, and providing appropriate motivation and reinforcement. This shows that the corrective actions taken based on the evaluation of the previous cycle have been effective in improving the quality of learning.

Furthermore, the author displays in the form of a bar diagram the results of the author's observations during the implementation of class actions from cycle 1 to cycle 2 as follows:



Figure 3. Percentage Diagram of Learning Motivation Observation Results

From the diagram above, it can be seen that the author's observation results show that motivated students continue to increase at each meeting. And students who are not yet motivated show a decrease in the percentage.

At the end of cycle 2, the teacher again gave students a test consisting of 10 multiple choice questions. The results of student learning in cycle 2 were 5 students getting a score of 90, 21 students getting a score of 80, 4 students getting a score of 70, 2 students getting a score of 60. So the classical average score was 79,06. Where the

minimum completion score for informatics subjects for class VIII at MTsN 3 Langkat was set at 76. This shows that the average class score has reached the set completion score. The following is a diagram of the average student scores in cycle 1 and cycle 2.

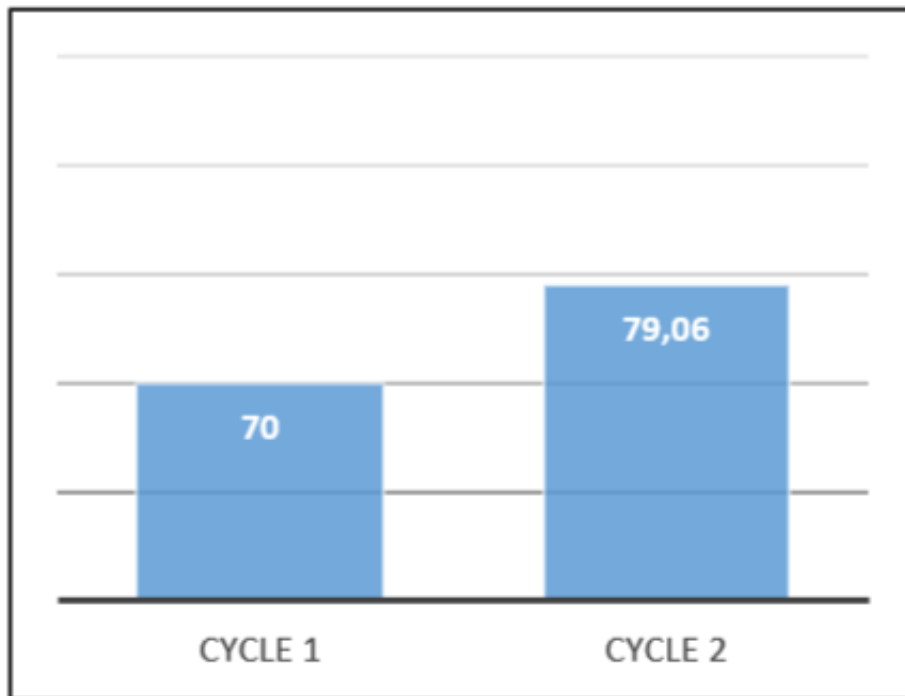


Figure 4. Average Value Diagram of Cycle 1 and 2

In Figure 4 above, it can be seen that there was an increase in learning outcomes in cycle 1, which obtained an average score of 70 to 79,06 in cycle 2.

At the end of Cycle 1 and 2, a questionnaire was distributed to students to observe the increase in their learning motivation during the implementation of learning using the digital literacy-based e-modules, the average can be seen in the following diagram.

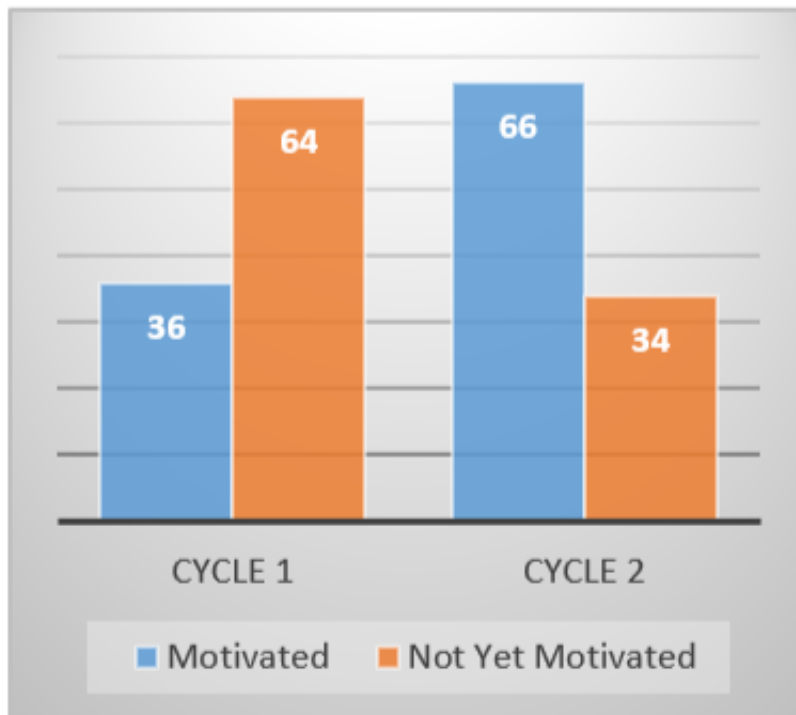


Figure 5. *Percentage of Motivation Questionnaire Results Cycle 1 and Cycle 2*

Based on the chart above, it can be seen that the results of the motivation questionnaire in Cycle 1 showed that 36% of students were motivated and 64% were not yet motivated. In Cycle 2, there was an increase in the number of motivated students to 66%, and a decrease in unmotivated students to 34%.

The data collected in this study consisted of observations of learning motivation through observation sheets and student questionnaires, as well as learning outcome scores obtained from tests in Informatics lessons using a digital literacy-based e-module among grade VIII students of MTsN 3 Langkat. The data were tabulated and analyzed to test the research hypothesis, then related to existing theories and previous studies to draw conclusions.

In the implementation of the study, the teacher explained to the students that Informatics lessons would use a digital literacy-based e-module. The teacher briefly explained the use of the e-module and the importance of the material. The class was divided into 8 groups, each consisting of 4 students arranged heterogeneously. Students then followed the steps of the learning activities in the e-module, used digital tools to search for information, and engaged in discussions to solve problems and construct new knowledge. After the discussion, the teacher asked groups to take turns presenting their group work results, while other groups were given the opportunity to respond. During each process, the teacher was assisted by an observer who used a prepared instrument to observe the teacher's activities. The teacher conducting the research also observed all student activities to assess their motivation during the learning process.

From the two cycles conducted in the study using the digital literacy-based e-module, it was evident that there was an increase in both learning motivation and academic achievement. Observation results at the end of Cycle 1 showed that 41,56% of students were motivated, increasing to 71,56% by the end of Cycle 2. The motivation questionnaires distributed to students also showed an increase in motivation from 36% in Cycle 1 to 66% in Cycle 2. Regarding learning outcomes, the average score in Cycle 1 was 70, and in Cycle 2 it increased to 79,06. The consistent improvement in motivation and learning outcomes in each cycle indicates that the digital literacy-based e-module is effective for teaching and learning activities.

These findings are in line with previous research conducted by Lufiah et al. (2019), titled "The Development of a Digital Literacy Module Based on Madiun Local Culture to Improve Learning Motivation in Elementary School Students", which concluded that digital literacy-based e-modules can improve students' learning motivation and outcomes [14]. In addition, research conducted by Ramdani (2022), titled "Improving Motivation and Learning Outcomes in Art and Culture Subjects through E-Modules", also showed that the use of e-modules increased the learning motivation of the university students involved in the study [15].

Based on data analysis, hypothesis testing, and supporting findings from previous studies, it can be concluded that the use of digital literacy-based e-learning modules can effectively enhance motivation and learning outcomes in Informatics for Grade VIII students at MTsN 3 Langkat.

The results indicate an increase in students' learning motivation following the use of a digital literacy-based e-module. This improvement can be explained by several internal factors within the e-module and the learning process, namely: (1) The e-module presents material with an attractive design and includes interactive elements such as quizzes, short videos, and hands-on exercises, which psychologically enhance student engagement and curiosity. (2) Students have control over the pace and sequence of their learning, providing a more personalized learning experience. (3) The e-module content is designed to be relevant to students' everyday digital lives, making the material feel meaningful and thereby boosting motivation.

The improvement in students' academic performance is attributed to several factors: (1) The application of multimodal learning principles in the e-module allows students to grasp concepts more easily compared to conventional methods. (2) The e-module offers quizzes with automatic feedback, reinforcing learning through immediate positive reinforcement, which helps students quickly recognize and correct their mistakes. (3) More motivated students tend to be more persistent in their studies, which positively impacts their academic achievement.

Although the e-module makes a significant contribution, several external factors also influence the increase in motivation and learning outcomes, such as parental or home environment support, especially in self-directed learning. The use of personal devices (laptops/gadgets) allows students to feel more comfortable and focused. Additionally, a supportive and responsive teaching style enhances students' confidence.

Although the results in Cycle 2 showed a significant increase in student motivation and learning outcomes, there are several important things that still need to be improved as suggestions and reflections so that the implementation of future learning becomes more optimal.

There are still several students who are not fully actively involved, especially in group discussions or when asked to express their opinions in front of the class. This shows that not all students respond to the intervention in the same way. Therefore, further assistance is needed.

Group discussions sometimes take longer than planned, so that some follow-up activities cannot be carried out optimally. To overcome this, it is necessary to provide a more realistic time allocation according to the level of difficulty of the task and to structure a more focused discussion, for example with a question guide or focused worksheet.

Students are indeed starting to dare to ask questions, but the quality of the questions still tends to be simple. To encourage high-level thinking, teachers can develop reflective activities at the end of learning so that students are used to thinking more deeply.

This research has been carried out as well as possible according to the procedure, but this research has several limitations that need to be considered in interpreting the results and the application of digital literacy-based e-modules in informatics learning, namely as follows:

1. This research was only conducted on MTsN 3 Langkat students and has not involved other schools with different characteristics.
2. The use of e-modules is only carried out within a certain time frame at several learning meetings, so it cannot describe the long-term impact on improving student learning outcomes as a whole.
3. The specifications of the devices and applications, especially the browsers used by students to access digital literacy-based e-modules, are quite diverse. However, these facility limitations can still be overcome in the computer laboratory, so that the implementation of e-modules can be evenly distributed optimally.
4. The different levels of digital literacy of MTsN 3 Langkat students also affect the effectiveness of the use of e-modules. Students who are less accustomed to using technology may need additional guidance in order to make maximum use of e-modules.
5. The focus of this research is only on increasing motivation and cognitive learning outcomes. Other aspects such as student learning interest, student activity, and student attitudes towards digital learning have not been evaluated comprehensively.

Conclusion

Based on the results of the research and discussion, it can be concluded that learning using a digital literacy-based e-module has successfully improved both learning motivation and learning outcomes in Informatics among Grade

VIII students at MTsN 3 Langkat. The observation results showed that students' learning motivation reached 41,56% at the end of Cycle 1 and increased to 71,56% at the end of Cycle 2. Furthermore, the motivation questionnaires distributed to students also indicated an increase in motivation, from 36% in Cycle I to 66% in Cycle 2. In terms of learning outcomes, the average score obtained by students in Cycle 1 was 70, which increased to 79,06 in Cycle 2.

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