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Enhancing Students' Technological Literacy Skills through the Wingeom Application in Learning Curved Surface Geometry: A Quantitative Analysis

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Abstract

This study investigates the impact of the Wingeom application on enhancing students' technological literacy skills in learning curved surface geometry at SMPN 37 Pekanbaru. This research a descriptive with a quantitative approach, the study involved 87 grade IX students as participants. Data were analysed using SPSS to evaluate various aspects of technological literacy, including the ability to operate computers, utilize the internet effectively, and think creatively when planning and exploring ideas. Based on the results of the study, show that most students can use computers and utilize the internet, be creative in presenting group materials using digital media, the ability to participate in digital spaces, communicate through digital technology media, and understand security when exploring, creating, and collaborating with digital technology after the application of the Wingeom application to the curved side room building material.

Keywords: Analysis, Mathematics, Technology literacy, Wingeom.

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1. Introduction

Education is a fundamental human right and a crucial tool. Education is the right of every citizen that must be implemented by the government in all circumstances to achieve the goals of national education(Winata et al., 2021). Education personnel must ensure that students get proper learning as they should. The government's program is to improve the quality of the Indonesian education system in order to strengthen literacy programs. This program has 14 graduates of the School Literacy Movement (GLS) certificate in elementary schools and universities. This movement is achieved through an unreflected literacy book 15 minutes before the course starts.

One of the new concepts of applied literacy is digital literacy or literacy in the field of information and communication technology (ICT). Technological literacy is a person's ability in education in the form of science, critical thinking skills, and the ability to make decisions as an effort to use technology and innovations made by humans properly and correctly (Latip, 2020; Ningrum & Wulandari, 2020). There are several components of technology literacy, including (1) Beyond and Functional Skill, namely the ability to use a computer and use the Internet; (2) Creativity, namely the ability of students to think creatively and be able to be imaginative when planning and exploring ideas; (3) Collaboration, is the ability to play a role in the digital space; (4) Communication, The ability to understand and understand others in the digital space; (5) Critical thinking and evaluation, is the ability to think critically, contribute, and analyse when dealing with information; and (6) E-safety, namely being able to understand how to secure when collaborating, creating, and exploring in digital technology.

However, based on IEA research (International Education Achievement) in the early 2000s, the results showed that Indonesia became the 29th country out of 31 countries in Asia, Africa, Europe and America related to the quality of children's reading (Rohman, 2018). Some students have low digital literacy awareness, and do not use technology properly to improve their digital literacy. Students use technology mainly smartphone as entertainment or consumptive interests only. Students are less able to analyse the information obtained through smartphone critically (Hastini et al., 2020). Therefore, teachers must take the initiative to improve students' technological literacy during this period.

One of the efforts to improve technological literacy is with technology-based learning media. According to Susanti & Suripah (2021), and Sukamto, (2022) that Over time, technology has become a very important need for all walks of life. This technological development also has a positive impact in the field of education, namely improving the quality of education. Learning media is a tool used to convey information in teaching and learning activities between teachers and students, (Sulistiani et al., 2021; Ulfah et al., 2021). The function of media in teaching and learning is to stimulate students to improve learning activities. Learning media using technology can increase students' interest in learning and technological literacy skills that are increasingly honed. The success of learning is largely determined by two main components, namely teaching methods and learning media, especially in mathematics subjects. This is similar

to the statement Suripah et al., (2022) that technology is an important aspect that supports the success of education activities.

Mathematics lessons in class can be taught more easily by using technology as a learning media. One of the mathematics topics that can uses technology as a learning media is the topic of build a curved side space. This is because teachers usually use teaching aids to explain the topic of build a curved side space, making it difficult for students to visualize the structure of these build a curved side space. This was also conveyed by Khalisa et al., (2021) that the material of building the curved side instilling the concept in this material is not easy, because building this curved side space in the student's shadow is still abstract. This of course makes it difficult for students to imagine the concept of build a curved side space. According to Novilanti (2021), one way to involve students in understanding curved-sided spatial structures is through the use of learning media. One of the learning media that can support students' knowledge and skills in the current era of globalization is the use of technology.

Learning media that are suitable for building materials for curved side spaces, one of which is Wingeom. Wingeom is a mathematical computer software application to build curved side spaces and build geometry, which is useful for creating 2-dim and 3-dim (Devia, 2019; Pradilpta & Hernawati, 2015; Rohmaini et al., 2020). Wingeom There is a very interesting feature, namely a very simple animation function, for example a curved side space object that can be rotated so that the visualization is very clearly visible. Program Wingeom Very complete, attractive and easy to use. You can rotate three-dimensional objects so that the visualization is very clear Amelia et al., (2021) Therefore, software needs to be applied in geometry learning so that students can clearly illustrate geometric shapes. By utilizing Wingeom as a learning media, of course, it is hoped that it can arouse students' imagination in understanding the concept of build a curved side space, as well as improve students' technological literacy skills in the current era of globalization.

There are several studies related to this study conducted by Pinahayu et al., (2018), Saputra (2020), and Černochová & Selcuk, (2020). All of the studies that have been conducted have only utilized Wingeom for introduction to geometry learning. In fact, mastery of technology is highly emphasized on the impact that students will face in the future. Therefore, it is necessary to emphasize student learning on mastery of technology as a form of preparation in facing the challenges of the digital era and the Industrial Revolution 4.0 (Indriani et al., 2021). In addition, this research is important to be carried out in Indonesia, as a form of preparing students for the technology-based world of work. Based on the problems found and referring to previously conducted research, the novelty of this research is using the Wingeom application as a learning tool and innovation. The use of this Wingeom application is expected to contribute to learning outcomes and students' technological literacy skills in the material on curved side space shapes in different populations, namely at SMPN 37 Pekanbaru.

2. Methods

This analytical research is quantitative research with descriptive approach. The descriptive approach in this case is used to describe the overall level of technological

literacy and to analyse each indicator of students' technological literacy abilities in mastering the material of curved-sided geometric shapes. This study aims to describe students' technological literacy abilities using the Wingeom application on the material of curved-sided geometric shapes at SMP Negeri 37 Pekanbaru. The subjects in this study were 87 grade IX students at SMP Negeri 37 Pekanbaru. Data were obtained using a survey method with an instrument, namely a response questionnaire after the Wingeom application was implemented. Before the response questionnaire was distributed, it was first validated by experts in their fields, namely lecturers in mathematics education from the Universitas Islam Riau This study aims to describe the technological literacy ability of students using the Wingeom application on the building material of the curved side space at SMP Negeri 37 Pekanbaru. The subject in this study is 90 grade IX students at SMP Negeri 37 Pekanbaru. Data was obtained by survey method with an instrument, namely a response questionnaire after the implementation of the Wingeom application. Before the questionnaire response was disseminated, it was first validated by experts in their fields, namely mathematics education lecturers from the Islamic University of Riau. With six indicators, namely beyond and functional skill, creativity, collaboration, communication, critical thinking and evaluation, and e-safety.

The instrument used in this study is in the form of a questionnaire on students' technological literacy skills in learning mathematics materials to build curved side spaces using the Wingeom application. Before the trial, the questionnaire was first validated to see the relevance of the instrument items with indicators of technological literacy skills by experts. The initial instrument that was prepared consisted of 28 statements, all of which were positive. After consulting with two experts, namely one material expert and one technology expert, input and suggestions were obtained to be balanced, the statement instrument should also include negative statements. Then in the 28 items of statements, there are two items of statements that have the same intention so that they are omitted. Therefore, based on input and suggestions, 26 statements were finally determined that were valid by experts and could be tested.

After the instrument was tested on 33 students, out of 26 statement items, there were 2 invalid statement items. To determine whether an item is valid or not, the $r_{calculate}$ value is compared with the r_{table}value. If $r_{calculeted} > r_{table}$, then the item is declared valid, and if $r_{calculated} < r_{table}$, then the item is declared invalid. The table was searched using a significance level of 0.05 with a 2-sided test and N=87/df=85. It was found that the r-value of the table was 0.213. The summary of the validity of the questionnaire instrument is presented in Table 1.

Table 1 - Summary of Validity of Questionnaire Instruments

Initial items	Invalid item	Invalid items	Valid items
26	2	1 and 15	24

Based on data analysis, of the 26 instrument statements for class IX, after the instrument test was carried out, there were 2 invalid statements. There were 24 valid items which were then used for research instruments and distributed to 87 grade IX students at SMP Negeri 37 Pekanbaru.

In addition to validity, the next stage is to test the reliability of the instrument. The reliability of an instrument indicates the consistency of data therefore a reliable instrument can be used to measure the same thing at different times by giving the same results. This reliability is carried out on statement items that have had validity in previous validity. The reliability of the instrument was carried out using the Cronbach's Alpha formula assisted by the SPSS version 25 program. The testing criteria were carried out at a significance level of 5%. A questionnaire response is considered reliable if the Cronbach's Alpha count is 0.6 (Haryadi and Winda, 2011: 45). The results of the reliability test are presented in Table 2.

Table 2 - Instrument Reliability Statistic

Cronbach's Alpha	N of Item
.870	24

Based on the reliability results in Table 2, it can be seen that the value of Cronbach's Alpha is 0.870 which means that the instrument is tested as reliable. Thus, it can be stated that the response questionnaire on students' technological literacy skills using Wingeom on the building material of the curved side space can be used to collect research data. The Likert scale categories and components used in the response questionnaire can be seen in Table 3.

Table 3 - Instrument Criteria

Score	**Instrument Criteria**
1	Never
2	Infrequently
3	Often
4	Always

Table 4 presents a series of indicator instruments used to measure or transmit certain aspects in the context of the research or analysis being carried out. These instruments are designed to provide a comprehensive and structured picture of the variables or phenomena being studied. This table is an important guide to validly interpreting the results and drawing conclusions.

Table 4 - Instrument Indicators

Component	**Indicator**	**Instrument Criteria**	
		+	**-**
Beyond and Functional Skill	Ability to use a computer and using the Internet	1, 2, 3, 4, 5, 6, 7	
Creativity	Ability to think creatively and imaginatively when planning and exploring ideas	8, 9, 10, 11, 12, 13, 14	
Collaboration	Ability to play a role in the digital space	15	16
Communication (Communication)	The ability to understand and understand others in the digital space	17,18	19
Critical Thinking and Evaluation	Able to think critically, contribute, and analyse when dealing with information	20	21
E-safety	Understanding security when creating, collaborating, and exploring digital technologies	22, 23	24

To find out the technological literacy ability of students using *the* Wingeom *application* on the building material of the curved side space at SMP Negeri 37 Pekanbaru, the percentage data of each component was calculated using the help of Microsoft Excel, with the percentage formula and criteria for the score of the analysis response questionnaire as shown in the following table:

$$P = \frac{f}{n} \times 100\% \qquad (1)$$

where

P: Percentage of the score sought
f: Frequency
n: number of respondents

Table 5 - Criteria for Percentage of Component of the Analysis Response Questionnaire

Score	Instrument Criteria
0% - 25%	Poor
26% -50%	Fair
51% - 75%	Good
76% - 100%	Excellent

3. Results and Discussion

3.1. Results

The normality test in this study was used to determine the distribution of data on the results of the instrument between the experimental class and the control class both before and after treatment, whether the data was normally distributed or not. This test was carried out using SPSS Software. The normality test of the student post-test data used Shapiro-wilk, the following are the results of the data obtained:

In this study, the author has collected the results of a response questionnaire that has been calculated with SPSS regarding students' technological literacy in the building material of the curved side room of class IX at SMP Negeri 37 Pekanbaru. There are six components of technological literacy skills, namely (1) functional skills and beyond, namely the ability to use computers and the Internet; (2) Creativity, which is the ability to think creatively and imagine when planning and exploring ideas; (3) Collaboration, which is the ability to play a role in the digital space; (4) Communication, the ability to understand and understand others in the digital space; (5) Critical thinking and evaluation, which is the ability to think critically, contribute, and analyse when dealing with information; and (6) E-safety, which is understanding safety when creating, collaborating, and exploring in digital technology.

For the ability to go beyond functional skills, namely the ability to use computers and use the Internet, the results obtained are sourced from the survey presented in Table 6 and Figure 1 as follows:

Table 6 - Results of the Questionnaire on the Ability to Utilize Computers and Utilize the Internet

Item	Ability to Use Computers and Utilize the Internet	Always	Often	Sometimes	Never
1	I have the ability to think creatively and imaginatively	21%	34%	38%	7%
2	I can combine colours on the Wingeom app	9%	15%	27%	49%
3	I easily understand the use of Wingeom application instructions	15%	19%	36%	30%
4	I Easily Operate the Wingeom App	10%	15%	36%	39%
5	I can reuse the Wingeom app	7%	28%	34%	31%
6	I can easily manage the Wingeom app	13%	25%	33%	29%
7	I can think creatively and innovatively in developing learning media	30%	34%	26%	9%

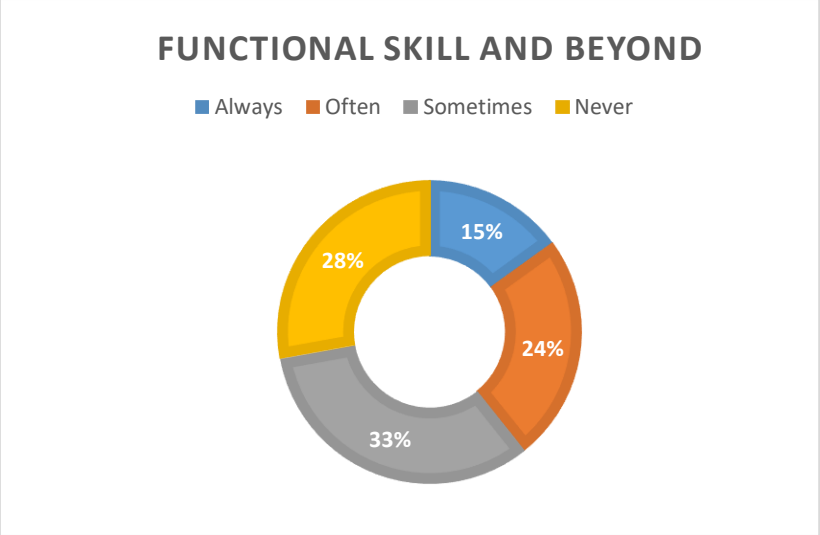

Figure 1 Percentage of Functional Skills and Beyond Components

Data from Table 6 and Figure 1 above shows that the majority of grade IX students of SMP Negeri 37 Pekanbaru are poorly trained in using computers and the internet in learning activities. Using the Internet as a medium to prevent unpopular thinking in the student environment, only some of the students channel their thoughts by taking advantage of Wingeom (Diana, 2016; Prihatmoko, 2016; Rahman, 2021). Quick and easy access to the information they need makes the learning process easier. Students declare that they can think creatively and imaginatively (21%). More than 50% of grade IX students of SMP Negeri 37 Pekanbaru can use and manage the application Wingeom. And 64% of students can think creatively and innovate in developing learning media. The above statement is supported by Suripah & Sthephani (2017) which states that Creative thinking is very important to develop in understanding mathematics education. This is because, through mathematical creative thinking skills, students can organize mathematical thinking skills in the learning process.

The ability of creativity, namely, the ability to think creatively and imaginatively when planning and exploring ideas, is obtained from the results of data analysis obtained from surveys. The results of the analysis are presented in Table 7 and Figure 2 as follows:

Table 7- Results of Creative Questionnaires in Creative and Imaginative Thinking Skills in Planning and Exploring Ideas

Item	Creative is the Ability to think creatively and imaginatively when planning and exploring ideas	Always	Often	Sometimes	Never
1	The order of the media presented is by the material presented	43%	29%	21%	8%
2	The media presented is relevant to learning objectives and indicators	39%	25%	22%	14%
3	Easy-to-understand presentation of material	30%	43%	21%	7%
4	The delivery of sample questions is the same as the material that has been presented	32%	36%	26%	6%
5	Presentation of material accompanied by examples	38%	30%	23%	9%
6	The material delivered for each meeting is achieved	31%	33%	22%	14%
7	The display in this learning media is interesting and not exaggerated	34%	36%	20%	10%

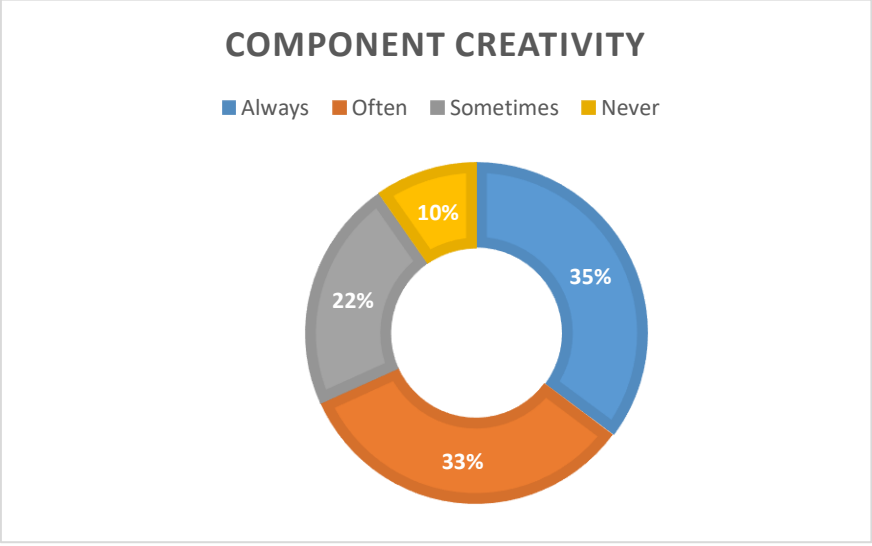

Figure 2 Percentage of Creativity Components

Judging from Table 7 and Figure 2 of the survey above, 64% of grade IX students feel that the media presented is relevant to learning objectives and indicators. More than half of the respondents admitted that the explanation of the material was easy to understand. 68% of respondents thought that the sample questions presented were by the material. This is supported by Hapsari (2021) and Maryani,(2023) that teachers need to be aware of the challenges facing millennial students, namely technology and media literacy. Therefore, teachers must master knowledge and skills in understanding

concepts and be creative in applying various learning strategies. In this case, it is creative that teachers can create a comfortable learning atmosphere. In the end, students can learn and be enthusiastic in carrying out learning activities creatively and without a sense of compulsion. The majority of respondents admitted that the material presented for each meeting was achieved. In addition, more than 50% of respondents enjoyed the display in learning media that was interesting and not excessive. In creative thinking skills, creativity is the path to the ability to be achieved. If a person has a high level of creativity, it indicates that he or she can think creatively. Students with a high capacity for creative thinking are students who focus on paying attention to the teacher, solving problems, and asking questions during the learning process (Putra et al., 2016; Streit & Erlyana, 2019; Sukarsono et al., 2020)

For the ability to Collaborate, which is the ability to play a role in the digital space, the results sourced from the survey are presented in Table 8 and Figure 3.

Table 8 - Results of the Questionnaire on Participating Skills in the Digital Space

Item	Ability to Participate in Digital Spaces	Always	Often	Sometimes	Never
1	I can teach the Wingeom application to others	11%	20%	34%	34%
2	This learning medium is not easy for me to use even without the help of others	13%	22%	44%	22%

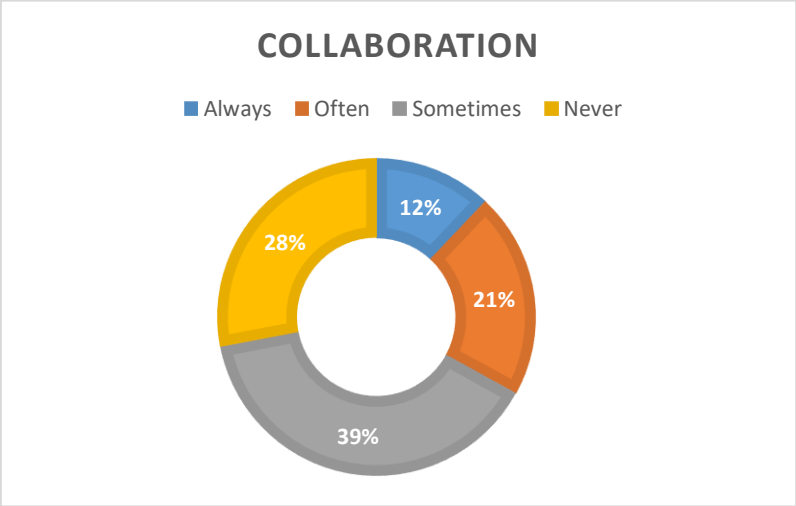

Figure 3 Percentage of Collaboration Components

Table 8 and Figure 3 above shows that only 31% of respondents can teach the Wingeom to others, this states that they are able to use the application but are not ready to give their knowledge to others. This is contrary to the opinion by Nugroho & Nasionalita (2020) that Digital technologies provide opportunities to collaborate in teams. In addition, more than 50% of respondents feel that they do not find it easy to use the app wingeom without the help of others, in other words they cannot afford to use the application wingeom self-taught. Based on these findings, it can be concluded that students have not been able to participate in the digital space. There are several stages that must be taken to be able to learn and use the application itself. The use of certain applications cannot be instantly integrated into learning (Salama et al., 2020).

Everything requires a process and time, both to be able to understand yourself and teach others.

For Communication skills, namely the ability to understand and understand others in the digital space, the results of the survey can be presented in the following Table 9 and Figure 4.

Table 9 - The Results of the Questionnaire can Communicate through Digital Technology Media

Item	Able to Communicate Through Digital Technology Media	Always	Often	Sometimes	Never
1	The language of the app used is simple and easy to understand	31%	33%	26%	9%
2	The selection of technology language is by the level of technology knowledge of students	24%	33%	34%	8%
3	The language used is not in accordance with the standard rules of Indonesian	9%	20%	26%	45%

Figure 4 Percentage of Communication components

The results of the survey referring to Table 9 and Figure 4 above show that, 64% of respondents can understand the application language used is simple and easy to understand. This is corroborated by (Novilanti, 2020; Suripah & Susanti, 2022)that Wigeom can be used As a learning medium, it is simple, easy to use and easy to understand by teachers and students. In particular, it makes it easier for students to understand the material during learning. As many as 57% of respondents admitted that the choice of technology language was in accordance with the level of technology knowledge of students. Meanwhile, the remaining 43% (37 students) still feel hesitant and have never even used technological language in the learning process. And 45% of respondents did not feel that the language used was not by the standard rules of Indonesian.

For the ability to evaluate and critical thinking, namely, the ability to think critically, contribute, and analyse when dealing with information, the results of the survey from respondents are obtained as the following Table 10 and Figure 5.

Table 10 - Results of the Questionnaire on Critical Thinking, Contributing, and Analyzing Skills When Dealing with Information

Item	Critical Thinking, Contributing, and Analytical Skills When Dealing with Information	Always	Often	Sometimes	Never
1	The image display on the Wingeom application is difficult to see and understand	7%	15%	30%	48%
2	The display of images on the Wingeom application is by the material presented	37%	29%	15%	20%

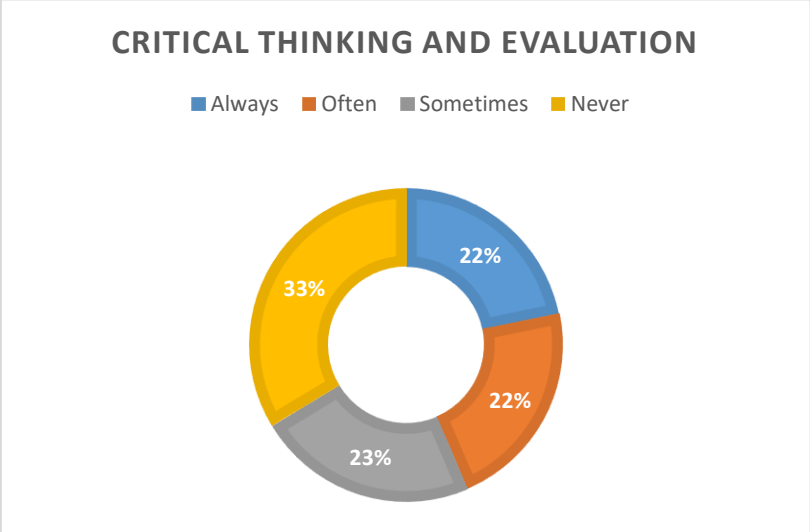

Figure 5 Percentage of Evaluation and Critical Thinking Components

Referring to Table 10 and Figure 5 of the survey results above, more than 50% of respondents agreed that they do not admit that the display of images on the application Wingeom difficult to see and understand (78%). Next, as many as 66% of respondents assessed the display of images on the application Wingeom by the material presented. According to Kristanto & Setiawan (2020) The ability to think at a higher level encourages students to interpret, analyse or even manipulate previous information so that it does not become boring. High-level thinking skills are skills to connect ideas and facts, analyse, explain, and determine hypotheses to the conclusion stage. This states that grade IX students of SMP Negeri 37 Pekanbaru can think critically, contribute, and analyse when faced with information.

For E-safety capabilities, which is knowing safety when collaborating, exploring, and creating with digital technology, the results of the survey are obtained as shown in Table 11 and Figure 6.

Table 11 - Results of the Questionnaire on the Ability to Know Security When Collaborating, Exploring, and Creating with Digital Technology

Item	Know Security When Collaborating, Exploring and Creating with Digital Technology	Always	Often	Sometimes	Never
1	Templates (buttons that contain directions to a special page) are easy to understand	33%	25%	28%	14%
2	The media application I use is not a problem	11%	10%	45%	33%
3	The time it takes me to unlock certain features is too long	14%	15%	33%	38%

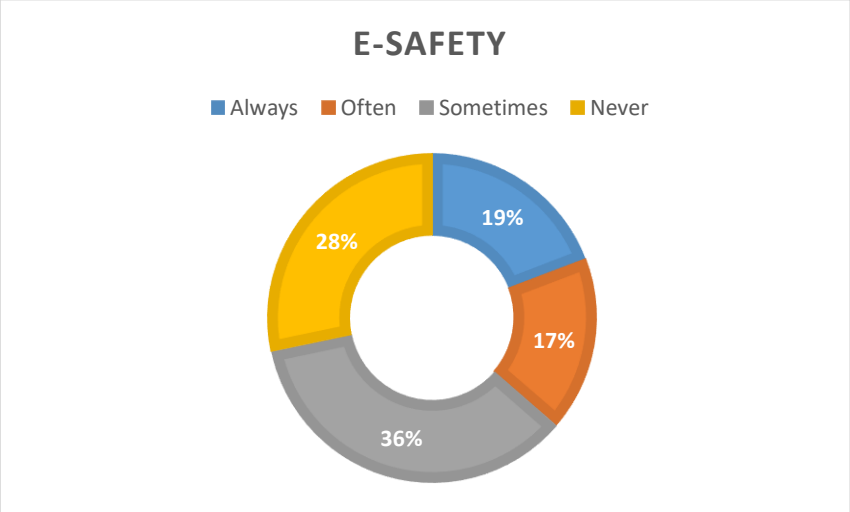

Figure 6 Percentage E-safety Components

Based on Table 11 and Figure 6 above, the instructions (buttons containing instructions to go to a special page) are easy to understand by 58% of respondents, of which more than 50% of respondents admit it. Furthermore, for the media application used without trouble, there was 78% recognition from respondents who felt that it was rare or never felt it. More than half of respondents disagreed that the time it takes to unlock a particular feature is too long (71%). So that the indicator of understanding security in exploring, building, and collaborating in digital technology is considered to be able to be understood by grade IX students of SMP Negeri 37 Pekanbaru. The results of Table 11 are supported by Nugroho (2021), Nugroho & Nanationalist (2020), Wibowo & Basri (2020) i.e. Components E-Safety emphasizing choices that ensure security when users explore, create, and collaborate with digital technology. Develop skills that enable them.

4. Conclusions

Data collected from students at SMP Negeri 37 Pekanbaru provides valuable insights into their technological literacy and creative thinking abilities. While most grade IX students have not yet fully mastered the use of computers and the internet for learning, there are

noticeable signs of improvement, especially in their use of the Wingeom application. Although only a small percentage of students can teach others how to use the application, more than half are capable of using it effectively for their own learning. This indicates that, despite still being in the early stages of digital tool mastery, students are already developing their creative thinking skills through technology, particularly in mathematics education. The fact that 64% of students can innovate and create learning media using Wingeom is a promising sign of their potential to engage with digital learning environments creatively. However, the data also reveals areas that require attention, particularly in collaboration, communication, and critical thinking within the digital realm. Many students face challenges in self-teaching applications like Wingeom, with some struggling to understand the technical language used. While students show promise in critical and creative thinking related to learning content, their digital communication and collaboration skills are still underdeveloped, as only 31% can teach others to use Wingeom. This underscores the need for further investment in enhancing both student and teacher digital literacy.

To improve students' technological literacy and creative thinking, schools should provide regular training on digital skills, including using tools like Wingeom, internet research, and collaboration. Teachers need continuous professional development to integrate technology effectively and foster creativity. Schools should ensure access to modern technology and align digital tools with curriculum goals. The digital literacy curriculum should cover not only basic tech use but also collaboration, communication, and critical thinking. Additionally, e-safety education is essential to ensure students navigate digital spaces securely and responsibly. These steps will help students thrive in an increasingly digital world.

Conflict of Interest

The authors declare no conflicts of interest.

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