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THE INFLUENCE OF *THE MIND MAPPING* LEARNING MODEL ON CRITICAL THINKING SKILLS REVIEWED FROM THE GENDER OF AL-AMIN *SECONDARY SCHOOL,* MALAYSIA STUDENTS

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Abstract
The mind mapping model can make students think critically and convey as much information as possible. The use of technology-based Mind Mapping learning models is still not widely applied in schools; teachers tend to still use manual methods, memorizing, and giving assignments, so that students are less enthusiastic or interested in the learning process. The purpose of this study is 1). Knowing the application of technology-based Mind Mapping learning models in ICT learning, 2). Assessing students' critical thinking skills in the application of the Mind Mapping learning model, 3). Assessing the influence of technology-based Mind Mapping learning models on students' critical thinking skills in terms of gender. The results of the study show that the mind mapping method can increase students' average scores by up to 25% within two learning cycles. The method used is descriptive analysis using pre-test and post-test, which are then further analyzed using Microsoft Excel data analysis to test validity, normality, T-test, and Shapiro-Wilk test to see the effect. Based on the results of the correlation test, the results were 0.548 while the r table value was 0.361, so it can be concluded that 0.548> 0.361 means there is a relationship between the two. Based on the results of the correlation test of 0.548, it is in the high or strong relationship category. It can be concluded that the criteria for the strength of the relationship between pretest and posttest learning outcomes show a very strong relationship, which indicates a significant increase in students' critical thinking skills after participating in the mind mapping method-based learning process. This reflects the effectiveness of the mind mapping method applied and provides an impact on critical thinking in the Tik lesson on the ethics of social media use by students.
Keywords: Mind Mapping, Learning Models, Technology

Model mind mapping dapat membuat siswa berpikir kritis dan menyampaikan informasi sebanyak mungkin. Penggunaan Model pembelajaran Mind Mapping berbasis teknologi masih belum banyak diterapkan di sekolah, para guru cenderung masih menggunakan metode manual, menghafal, dan memberikan tugas, sehingga siswa kurang antusias atau tertarik dalam proses belajar. Tujuan penelitian ini adalah 1). Mengetahui penerapan model pembelajaran Mind Mapping berbasis teknologi dalam pembelajaran TIK, 2). Menilai kemampuan berpikir kritis siswa dalam penerapan model pembelajaran Mind Mapping, 3). Menilai pengaruh model pembelajaran Mind Mapping berbasis teknologi terhadap kemampuan berpikir kritis siswa ditinjau dari gender. Hasil penelitian

menunjukkan bahwa metode mind mapping dapat meningkatkan nilai rata-rata siswa hingga 25% Dalam waktu dua siklus pembelajaran. Metode yang digunakan adalah analisis deskriptif menggunakan pre-test dan post-test test yang kemudian di analisis lebih lanjut menggunakan data analysis microsoft excel untuk melakukan uji validitas, normalitas, uji T, dan uji Shapiro-Wilk untuk melihat pengaruh. Berdasarkan hasil uji korelasi didapatkan hasil sebesar 0,548 sedangkan nilai r tabel 0,361 maka dapat disimpulkan yaitu 0,548 > 0,361 artinya terdapat hubungan diantara keduanya. Berdasarkan hasil uji korelasi sebesar 0,548 berada pada kategori hubungan tinggi atau kuat. Dapat disimpulkan bahwa kriteria kekuatan hubungan antara hasil belajar pretes dan posttest menunjukkan adanya hubungan yang sangat kuat, yang mengindikasikan bahwa peningkatan yang signifikan dalam kemampuan berpikir kritis siswa setelah mengikuti proses pembelajaran berbasis metode mind mapping. Hal ini mencerminkan efektivitas metode mind mapping yang diterapkan serta memberikan dampak berpikir kritis pada pelajaran Tik materi etika penggunaan media sosial oleh siswa
***Kata kunci**: Mind Mapping, Model Pembelajaran, Teknologi*

INTRODUCTION

The learning model, one of which is through the integration of technology with visual learning strategies, such as *Mind Mapping*. The correct arrangement of learning activities makes it easier for students to learn, interaction between teachers and students, and the delivery of subject matter (Wulandari, 2024). According to Siahaan et al. (2022), several types of learning models can be identified, namely: a) student-centered models, b) tracing-based models, c) collaborative models, and d) models that are integrated with technology. *This Mind Mapping* model utilizes digital tools and technology-based applications to facilitate the preparation of ideas, concept mapping, and connectivity between information systematically (Nusi et al., 2024). The application *of technology-based Mind Mapping* is considered to increase student involvement and facilitate deep learning because it involves visual, verbal, and logical processing simultaneously (Buran & Filyukov, 2020). With the support of technology, mind mapping becomes more interactive, collaborative, and flexibly accessible.

Since the 21st Century, the ability to think critically is something that needs to be developed in schools, especially in the learning of Information and Communication Technology (ICT). *Mind Mapping* as a learning model allows students to organize knowledge, evaluate information, and connect relevant concepts, which are important elements of critical thinking (Nuryanti et al., 2021). The application of *Mind Mapping* in learning activities is able to improve critical thinking skills because it encourages students to analyze the relationships between concepts, solve problems, and draw logical conclusions (Ismail et al., 2020). This model can help students overcome difficulties in analyzing information (Hariati & Mizkat, 2024).

In addition to the learning method factor, the gender aspect affects the achievement of students' critical thinking skills. This critical thinking was followed by Plato, Aristotle, and other Greek thinkers, all of whom saw critical thinking as the ability to question, test, and reflect on ideas and values (Rahardhian, 2022). Several studies have revealed

differences in learning styles, cognitive strategies, and technology use preferences between male and female students, which have the potential to affect the effectiveness of certain learning models (Tüysüz et al., 2022).

Research that combines the analysis of the influence *of technology-based Mind Mapping* with gender variables is still relatively limited, so further studies are needed related to the influence of Mind Mapping on learning outcomes based on gender. This research is important to examine the application of technology-based *Mind Mapping* in ICT learning, assess students' critical thinking skills in the process, and analyze its influence based on gender factors. The results of the research are expected to contribute to the development of adaptive and inclusive learning strategies, to be able to accommodate the diversity of students' learning styles while optimizing the use of technology in education (Al-Samarraie & Hurmuzan, 2020)

METHOD

This study applies an experimental method using Pre-Experimental Designs. This approach is carried out systematically to determine the relationship between variables through the provision of certain treatments under controlled conditions. The design chosen is a one-group pretest-posttest design, where, before the treatment is given, a pretest is first carried out to measure the initial condition, then, after the treatment is carried out, a posttest to see any changes or effects of the treatment.

Treatment outcomes can be measured more accurately because they allow for comparisons between pre- and post-treatment conditions. The researcher used a one-group pretest-posttest design the considering that this study aims to see the influence of the learning model on students' critical thinking skills. Therefore, the study does not involve a control class or an experimental class, but only one group with limited research variables. This research was carried out at Al-Amin Secondary School, Kemaman, Trengganu, Malaysia, from February 10 to March 11, 2025.

The population in this study is all grade VIII/Tier 2 students at Al-Amin Secondary School, Kemaman, Trengganu, Malaysia. The research sample was taken from the population using the Total Sampling technique, which is a method that involves all members of the population as a sample. Thus, the sample of this study amounted to 30 students in grade VIII. This study examines two variables, namely the Mind Mapping learning model as an independent variable (X) and students' critical thinking ability as a dependent variable (Y).

RESULTS AND DISCUSSION

The results obtained in this study were further analyzed using the help of Microsoft Excel to tabulate the data, and then the tabulated data was used to the validity test process. The results of the validity test of the instrument in this study were as follows:

Table 1. Test Question Validation Calculation Results

NO	QUESTION POINTS	RESULT	INFORMATION
1	Number Questions	0,41	**VALID**
2	Number Questions	0,46	**VALID**
3	Number Questions	0,55	**VALID**
4	Number Questions	0,72	**VALID**
5	Number Questions	0,41	**VALID**
6	Number Questions	0,55	**VALID**
7	Number Questions	0,77	**VALID**
8	Number Questions	0,57	**VALID**
9	Number Questions	0,64	**VALID**
10	Number Questions	0,57	**VALID**
11	Number Questions	0,77	**VALID**
12	Number Questions	0,75	**VALID**
13	Number Questions	0,65	**VALID**
14	Number Questions	0,50	**VALID**
15	**NUMBER QUESTIONS**	**0,39**	**VALID**

Source: Data Processed, 2025

Based on the table above, when compared to the r-value of the table of 0.36, the results of r calculating question items 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15 are greater than 0.36, so that it can be concluded that question items 1 to 15 are valid.

A. Presentation of Students' Critical Thinking Ability Data Results Using *Technology-Based* Mind Mapping Lesson Method

Table 2. *Pre-Test* and *Post-Test* Data for Male Students

NO	***PRETEST* (L)**	***POSTEST* (L)**
1	5	12
2	7	13
3	8	11
4	7	12
5	6	11
6	9	11
7	5	10
8	8	10
9	6	13
10	7	11
11	9	12
12	6	10

13	9	12
SUM	92	148
AVERAGE	7,08	11,38
MAX	9	13
MIN	5	10

Source: Research Results, 2024

Table 3. Pre-Test *and* Post-Test *Data* for Female Students

NO	***PRETEST*** **(P)**	**POSTEST VALUE (P)**
1	8	11
2	7	15
3	7	13
4	9	12
5	9	14
6	10	13
7	11	14
8	12	15
9	10	13
10	9	12
11	10	14
12	10	15
SUM	112	161
AVERAGE	9,33	13,42
MAK	12	15
MIN	7	11

Source: Research Results, 2024

Table 2 shows that the average score of male students is 7.08 from the pretest data, and the highest NAI is at a score of 9. Meanwhile, the lowest score in the pretest was 5. And the results of the pretest were obtained with an average score of Women (Table 3) with the acquisition of 9.33 from the pretest data, the highest score was at a score of 12. Meanwhile, the lowest score in the pretest was 7. Based on the posttest results, the average score of male students was obtained with an acquisition of 11.38 from posttest data, and the highest NAI was at a score of 13. Meanwhile, the lowest score in the Posttest was 10. And the results of the posttest were obtained by an average female score with a score of 13.42 from the Posttest data, the highest score was at a score of 15. while the lowest score in the Posttest was 11.

Based on the results of the pretest and posttest obtained, it can be concluded that there is a significant increase in students' critical thinking skills after participating in learning. In the pretest, the average score of male students was 7.08, with the highest score of 9 and the lowest score of 5, while the average score of female students was 9.33, with the highest score of 12 and the lowest score of 7. From these results, it can be concluded that in the early stages, students' critical thinking skills still need to be improved. And in the

posttest, there was a clear improvement in both groups of students. The average score of male students increased to 11.38, with the highest score of 13 and the lowest score of 10. Meanwhile, female students experienced a higher increase, with an average score of 13.42, the highest score of 15, and the lowest score of 11.

Thus, it can be concluded that female students have higher scores than male students in both the pretest and posttest. Overall, these results show that the learning carried out successfully improves students' critical thinking skills, with women showing better achievement

B. Normality Test

a. Normality Test for Male Students

The decision-making criteria are determined that if the significance value (Sig.) is greater than 0.05, H0 is accepted, while if the significance value (Sig.) is less than 0.05, H0 is rejected. The results of the normality test conducted using *the Shapiro-Wilk Test* with the help of SPSS software version 26 are presented in the following Table 4:

Table 4. Normality Test of Female Students

	KOLMOGOROV-SMIRNOVA			**SHAPIRO-WILK**		
	Statistics	Df	Itself.	Statistic	df	Itself.
PRETESTLA	0,157	13	.200*	0,908	13	,175
POSTTESTLA	0,184	13	.200*	0,896	13	,116

Based on Table 4 above, the normality test using *the Shapiro-Wilk test* obtained a pre-test *significant value* of 0.175 > 0.05, and a post-test significant value of 0.116> 0.05. So the criteria for the decision are H0 accepted and Ha rejected. So, the conclusion from the data is that the results of *the pretest* and *post-test* have normal distribution data.

b. Normality Test of Female Students

Table 5. Normality Test of Female Students

	KOLMOGOROV-SMIRNOVA			**SHAPIRO-WILK**		
	Statistics	df	Itself.	Statistic	df	Itself.
PRETEST	0,172	12	.200*	0,941	12	,513
POSTTEST	0,172	12	.200*	0,920	12	,290

Table 5 shows the results of the normality test in female students using *the Shapiro-Wilk test*. The *pre-test* results were 0.513 > 0.05, and *the post-test results* were 0.290> 0.05. It can be understood that H0 is accepted and Ha is rejected. It was concluded that *the results of the pretest* and *post-test* had normal distribution data

C. T Test

H0: There is no influence of the technology-based *Mind Mapping* learning model on students' critical thinking skills reviewed by gender.

H1: There is an influence of the technology-based *Mind Mapping* learning model on students' critical thinking skills from *a gender perspective*

D. Uji Paired Sampel Test

Table 6. Paired Sample Test Results

							T	DF	SIG. (2-TAILED)
					Lower	Upper			
PAIR 1	Pretest - Posttest	-4,200	1,633	0,327	-4,874	-3,526	-12,860	24	0,000

Table 6. The results of *the paired sample t-test* are shown to test the hypothesis. The decision-making criterion if the significance value < 0.05, then H0 is rejected; if > 0.05, then Ha is accepted. The results of the analysis showed that the significance value (*Sig*. 2-tailed*)* was 0.000 < 0.05, so H0 was rejected and Ha was accepted. In addition, the value of t calculated (12.860) is greater than the t table (2.101), so H0 is also rejected. Therefore, it can be concluded that the application *of the mind mapping* method has a significant influence on the critical thinking skills of grade VIII students at Al-amin Secondary School, Kemaman, Trengganu, Malaysia.

After conducting the t-test, the data on students' critical thinking skills were distributed normally and linearly. The step taken by the researcher is to conduct a correlation hypothesis test. This hypothesis test compares the *value of Sig*. with the value of the calculation of *Pearson correlation*. As for the correlation requirements, if the *value of sig*. ≤ 0.05, meaning that there is a significant correlation between *the pretest* and *posttest variables*

Table 7. Product-Moment Correlation Test

		PRETEST	POSTTEST
PRETEST	Pearson Correlation	1	.548**
	Sig. (2-tailed)		0,005
	N	25	25
POSTTEST	Pearson Correlation	.548**	1
	Sig. (2-tailed)	0,005	
	N	25	25

Table 7 shows that the value of Sig. R is calculated, which is 0.005 < 0.05. The hypothetical answer is that H0 is rejected and Ha is accepted. It can be concluded that students' critical thinking skills in the application of the mind mapping learning model have a significant relationship between the two variables.

DISCUSSION

The Influence of Students' Critical Thinking Skills on ICT Materials (ASK) for Class VIII

Critical thinking is a cognitive ability that allows individuals to evaluate, analyze, and consider a concept or idea after understanding the information in depth. This process involves the skill of comparing information obtained from external sources with existing knowledge, resulting in a more objective and reflective understanding. In addition, critical thinking includes the ability to formulate logical arguments, evaluate evidence, and make decisions based on rational analysis (Aizikovitsh-Udi & Cheng, 2022). In the context of education, the development of critical thinking skills is essential because it supports students in solving complex problems, improving information literacy, and preparing them for the challenges of the 21st century (Özkan & Bümen, 2022; Choy & Cheah, 2020). Critical thinking is a critical ability that helps students understand learning materials, including ethical materials, in using social media in the classroom. This ability allows students to analyze, evaluate, and solve problems related to concepts such as typing on social media, the spread of hoax news, and the dissemination of inappropriate data or photos. In ICT learning, critical thinking is. It provides a number of benefits, namely in-depth understanding of concepts, improved learning outcomes, and relevance to real life.

First, a deep understanding of the concept means that students not only memorize the material but also understand the reasons behind the dangers of misusing social media and its impact on daily life. Critical thinking can help students in analyzing the relationship between good social media use and correctly assessing its impact on society. This is also shown in observations conducted by researchers at Al-amin Secondary School, Kemaman, Trengganu, Malaysia, showing that after the application of critical thinking, students can understand the concepts that exist in ethics in using social media. This is also supported by research conducted by Nastiti showing that the application of critical thinking to materials other than economic activities can increase students' in-depth understanding of concepts (Nastiti et al., 2022).

Second, the improvement of learning outcomes carried out by researchers using the mind mapping method can increase students' average scores by up to 25% within two learning cycles. This critical thinking ability can allow students to solve problems and can also provide strategies to solve problems. This is also supported by research conducted by Murti et al., which shows that the application of the mind mapping method can improve students' critical thinking, especially in economic activity materials (Murti et al, 2022

The Effect of the Use of Technology-Based Mind Mapping Methods on Students' Critical Thinking Skills Reviewed from Gender

The results of observations conducted at Al-amin Secondary School, Kemaman, Trengganu, Malaysia, show that students tend to be passive in learning. This is because teachers tend to use the lecture method during the learning process. The existence of the

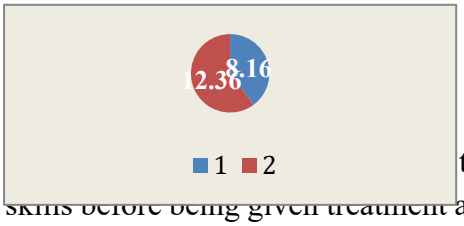
lecture method reduces the ability to participate and also the ability to think critically in the learning process (Latifah et al, 2022). In the results of observations, teachers do not provide stimulation related to cases related to ethical materials on the use of social media because the lack of case giving in the learning process also has an impact on students' critical thinking skills. This is supported by the fact that students have not received explanations from teachers regarding ICT lessons and ethics materials for social media use.

The condition of students who experience difficulties in thinking flexibly or critically is caused because students only refer to the answers to the teacher's explanation. The teacher provides the material to the students, including material that must be memorized by the students. This condition also does not encourage students to think critically because students are required to memorize the material. So the focus of this study is the learning method that encourages students to improve their critical thinking skills. The researcher conducted *a pretest* to evaluate the initial abilities of students before the application of *the Mind Mapping* method. By carrying out *a pretest*, researchers can identify students' level of understanding and skills in critical thinking. The data obtained from *the pretest* is a reference in designing appropriate and relevant interventions, and allows researchers to measure the development of students' abilities after the learning method is applied.

The *results of the Pretest* were obtained with an average score of 8.16. From the pretest data, the highest NAI was at a score of 12. Meanwhile, the lowest score in the *pretest* was 5. It can be concluded that students cannot yet think critically. The results of the *pretest* found that the average student score was still low. The researchers then used the treatment to improve critical thinking skills. The activity was carried out by providing opportunities for students to make *mind maps* related to the material on the ethics of using social media.

After being given treatment using *the mind mapping method*, students were given *a posttest* related to the economic activity material. The purpose of giving *post-tests* is to measure students' critical thinking skills. The results of *the posttest* were obtained with an average score of 12.36. From the *posttest data*, the highest score was at a score of 15. Meanwhile, the lowest score in the *post-test* was 10. It can be concluded that students begin to have the ability to think critically. The results *of the pre-test* and *post-test.* The researcher continued the analysis activities to determine the influence of the mind mapping method. The graph of the average *pre-test* and *post-test scores* is presented in Figure 1

Figure 1. Average Results of Students' Critical Thinking Ability



that the average results of students' critical thinking skills before being given treatment and after being given treatment have increased. These results can be seen from the average *pretest* score (1), which is 8.16, and the average *post-*

test (2), which is 12.36. From a learning theory perspective, these findings are in line with the principles *of constructivism*, which emphasize that active and participatory learning can improve students' understanding (Dewi et al., 2024). In this context, the application of *the mind mapping* method allows students to organize information in a more visual and structured way, making it easier for them to remember and relate to the concepts taught. This theory is supported by research that shows that visual techniques, such as *mind mapping*, can improve students' memory and understanding of subject matter (Fatmawati, 2020).

In addition, the increase in grades can also be explained through active learning theory, which states that students' involvement in the learning process will increase their motivation and learning outcomes (Kusumawardani, 2022). The presence of greater interaction during learning using *mind mapping*, students become more involved in discussions and collaborations, which in turn strengthens their understanding. Overall, these results suggest that the use of innovative and interactive learning methods, such as *mind mapping*, can not only improve student learning outcomes but also help them develop critical thinking skills. This has positive implications for educational practices, especially in an effort to create a more dynamic and effective learning environment.

The review of the influence of *the mind mapping method* was carried out by a hypothesis test. The hypothesis test is carried out through 3 stages, namely the normality test, the t-test, and *the moment product correlation test.* Based on the results of the normality test using *the Shapiro-Wilk test*, a significant pre-test value of 0.437 > 0.05 was obtained, and a post-test significant value of 0.103 > 0.05. So the criteria for the decision are H0 accepted and Ha rejected. So, the conclusion from the data is that the learning results of *the pretest* and post-test have data that is normally distributed.

From the point of view of statistical theory, normality tests are important to ensure that further analysis can be carried out by appropriate methods. In this context, the acceptance of the null hypothesis (H0), which states that normally distributed data provides a basis for proceeding to the next analysis, namely the t-test (Zahroh, 2020). Normal distribution theory states that many phenomena in the social sciences, including critical thinking skills, tend to follow normal distributions when sample sizes are large enough. This allows researchers to use more robust and valid inferential techniques.

With the results of the normality test showing that the data is normally distributed, the researcher can proceed to the t-test analysis to assess the significant difference between the average *pretest* and *posttest* scores. This test will provide a clearer picture of the influence of *the mind mapping* method on improving student learning outcomes. Overall, the results of this normality test strengthen the argument that the learning method used, in this case, *mind mapping*, not only improves student learning outcomes but can also be validly analyzed with appropriate statistical techniques (Subakti H, 2021). These findings are important to provide a solid foundation for the development of more effective learning methods in the future.

After the normality test was carried out, the researcher continued with the t-test (*paired sample t-test*) (Ningsih M.Y, 2021). The *paired sample t-test* was used to test the hypothesis. The decision-making criterion if the significance value < 0.05, then H0 is rejected; if > 0.05, then Ha is accepted. The results of the analysis showed that the significance value (Sig. 2-tailed) was 0.000 < 0.05, so H0 was rejected and Ha was accepted. In addition, the value of tcal (12.860) is greater than the t table (2.11), so H0 is also rejected. Therefore, it can be concluded that the application *of the mind mapping* method has a significant influence on the critical thinking ability of grade VIII or Level 2 students at Al-amin Secondary School, Kemaman, Trengganu, Malaysia.

The t-test was carried out to find out if there was a significant effect after the treatment stage, by comparing the results obtained from *the pretest* and *posttest (*Elpira, 2015). Through this analysis, researchers can evaluate how many changes occur in students' abilities due to the application of *the mind mapping* method. In other words, the t-test provides clear information about the effectiveness of *the mind mapping* method in improving students' critical thinking skills, as well as helps in understanding the impact *of the mind mapping* method used in the research on grade VIII or Level 2 students at Al-amin Secondary School, Kemaman, Trengganu, Malaysia.

The last stage is that the researcher uses a correlation test to determine the relationship between variables (Ali, M.M., 2022). Based on the results of the correlation test, the result was 0.548 while the r-value of the table was 0.361, so it can be concluded that it is 0.548 > 0.361, meaning that there is a relationship between the two. The relationship between the two is positive. Based on the results of the correlation test of 0.548, it was in the category of high or strong relationships. It can be concluded that the criteria for the strength of the relationship between *pretest* and *posttest* learning outcomes show a very strong relationship, which indicates that there is a significant improvement in students' critical thinking skills after participating in the learning process based on *the mind mapping* method. This reflects the effectiveness of the *mind mapping* method applied and has an impact on critical thinking lessons on the ethical use of social media by students.

CONCLUSION

The application of the technology-based *Mind Mapping* learning model in ICT learning in grade VIII or Level 2 students at Al-amin Secondary School, Kemaman, Trengganu, Malaysia improved students' critical thinking skills, with women showing better achievements. The application of *the mind mapping* method allows students to organize information in a more visual and structured way, making it easier for them to remember and relate the concepts taught The influence of technology-based *Mind Mapping* learning model on the critical thinking ability of male students is lower than that of female students judging from grades The average male student is 11.38 with the highest score of 13 and the lowest score of 10. Meanwhile, female students are higher, with an average score of 13.42, the highest score of 15, and the lowest score of 11.

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