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Remap-TPS dengan *Xmind*: Model Pembelajaran untuk Meningkatkan Literasi Digital dan Hasil Belajar Siswa

Remap-TPS with Xmind: A Learning Model to Improve Students' Digital Literacy and Learning Outcomes

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Abstrak

Literasi digital sangat penting untuk menghadapi era digitalisasi saat ini. Namun, beberapa penelitian menunjukkan literasi digital di Indonesia masih dibawah rata-rata dan perlu diberdayakan. Literasi digital yang kurang optimal dapat berdampak pada rendahnya hasil belajar siswa. Oleh karena itu, penelitian ini bertujuan untuk menganalisis pengaruh model pembelajaran *Reading Concept Mapping Think Pair Share* (*Remap-TPS*) berbantuan aplikasi *Xmind* untuk meningkatkan literasi digital dan hasil belajar siswa. Penelitian ini dilaksanakan di SMA Negeri 9 Malang, Lowokwaru, Jawa Timur, Indonesia pada semester ganjil tahun ajaran 2023/2024. Penelitian ini merupakan *quasi-eksperimen* dengan desain *nonequivalen pretest-posttest*. Responden dalam penelitian ini adalah kelas X IPA 3 dan X IPA 4 dengan jumlah 70 siswa. Data dikumpulkan melalui *quesioner* untuk mengukur literasi digital dan soal *essay* untuk mengukur hasil belajar. Hasil penelitian menunjukkan bahwa model pembelajaran *Remap-TPS* berpengaruh signifikan terhadap literasi digital dan hasil belajar siswa. Hal ini mengindikasikan bahwa model *Remap-TPS* bantuan aplikasi *Xmind* dapat menjadi alternatif solusi dalam merancang proses pembelajaran untuk memberdayakan literasi digital dan hasil belajar siswa.

Kata kunci: *Reading Concept Mapping*; *think pair share*; *Xmind*; literasi digital; hasil belajar

Abstract

Digital literacy is critical in the current era of digitalization. However, several studies show that digital literacy in Indonesia still needs to be improved and strengthened. Less than optimal digital literacy can impact low student learning outcomes. Therefore, this research aims to analyze the effect of the Reading Concept Mapping Think Pair Share (Remap -TPS) learning model assisted by the Xmind application to improve digital literacy and student learning outcomes. This research was conducted at SMA Negeri 9 Malang, Lowokwaru, East Java, Indonesia, in the odd semester of the 2023/2024 academic year. This research is a quasi-experiment with a pretest-posttest non-equivalent design. Respondents in this study were classes X Science 3 and X Science 4 with 70 students. Data was collected through questionnaires to measure digital literacy and essay questions to measure learning outcomes. The research results show that the Remap-TPS learning model significantly affects digital literacy and student learning outcomes. This indicates that the Remap-TPS model, assisted by the Xmind application, can be an alternative solution in designing learning processes to empower digital literacy and student learning outcomes.

Keywords: *Reading Concept Mapping; think pair share; Xmind; digital literacy; learning outcomes*

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INTRODUCTION

Digital literacy is a person's ability to understand, find, evaluate, use and manage information to increase knowledge (Cassidy et al ., 2018; Littlejohn et al., 2012). Digital literacy is not only limited to mastery of technology (List, 2019) but also the ability to identify learning material concepts through digital media effectively (Ferry et al ., 2022). Digital literacy has become necessary in designing classroom learning processes (Falloon, 2020) to support achieving learning objectives (Waemusa & Jongwattanapaiboon, 2023).

Digital literacy is crucial for students' success in selecting and accessing the right learning resources (Musiin & Indrajit,2020). Digital media makes it easier to explore and utilize information on the internet (Haleem et al., 2022; Rahmatullah et al., 2022). The information spread widely and comprehensively indicates that students must understand digital literacy (Rusdi et al .,2023). A good understanding of digital literacy enables students to use technological devices wisely and carefully (Huda et al., 2017) and analyze information carefully (Mufidah et al., 2023). Digital literacy is also the basis for developing problem-solving abilities by thinking critically, creatively, flexibly and ethically (Vod ă et al., 2022).

According to Nisafani et al. (2020), students with adequate digital literacy knowledge can confidently complete their assignments. On the other hand, students with a low level of digital literacy tend to negatively affect stress levels due to technology (technostress) (Mufidah et al., 2023). Students also experience difficulties finding, evaluating, and using information sources (La Torre et al ., 2019). Thus, digital literacy is not just a life skill but an essential foundation for facing the demands of Education and information in the current era of digitalization.

Even though digital literacy is very important for students today, several research results show that students' digital literacy in Indonesia still needs to be in the low category. (Budiman & Syafrony, 2023; Purnamasari et al ., 2021;Rusydiyah et al ., 2020). The Organization for Economic Cooperation and Development (OECD) (2016) shows Indonesia's low literacy and numeracy scores, which are in the 35th position out of 40 countries participating in the Program for International Assessment of Adult Competencies (PIAAC). Furthermore Reading Literacy Activity Index (ALIBACA) data (2019) shows Indonesia's literacy is 37. 32% (low category), and the information access dimension is 23.09% (deficient category). This data shows that the development of digital literacy in Indonesia is still below average, so it needs to be empowered.

The low level of digital literacy aligns with the facts that occurred at SMA Negeri 9 Malang. Based on the results of preliminary June 2023 studies showing student digital literacy 23.09% in the low category. The data was analyzed based on the results of student and teacher answers via questionnaires. The lack of integration of digital media in the learning process results in digital literacy still being in the low category (La Torre et al ., 2019), so it needs to be empowered. Apart from that, digital literacy is also known to be a mediator in influencing students' cognitive learning outcomes (Yustika & Iswati, 2020). Furthermore according to Meirbekov et al. (2022), inadequate digital literacy can hurt student learning outcomes.

Literacy is in line with their conceptual knowledge (Nicol, 2021). Digital literacy allows students to examine material more critically, especially in the face of the diversity of widely distributed information (Polizzi, 2020). Students' ability to search for and explore appropriate information helps them distinguish between truth and false information (Hanurani, 2020). Apart from that, a need for more understanding in managing information on the internet as an appropriate learning resource is a factor causing low student learning outcomes (Regmi et al., 2020). In line with research by Rusdi et al. (2023), digital literacy positively correlates with student learning outcomes. Furthermore according to Kim (2019), digital literacy influences learning outcomes. Thus, digital literacy makes a positive contribution to student learning outcomes.

Learning outcomes are students' success level in studying learning material at school (Ibáñez et al ., 2020). Digital literacy and learning outcomes are closely related, where media use in the learning process helps students manage their learning (Anthonysamy et al ., 2020). Students with good digital literacy tend to achieve optimal learning outcomes (Hu & Yu, 2021). Learning outcomes reflect an individual's learning performance, which is obtained through grades and determines the success of learning objectives (Jufrida et al ., 2019).

However, several research results show that learning outcomes still need to improve at all levels of Education in Indonesia (Umami, 2018). The research results by Amtu et al. (2020) show that student learning outcomes are low. Furthermore Nicol (2021) shows that the low quality of Education in Indonesia results in low student academic achievement. The facts at SMAN 9 Malang also prove the low learning outcomes. Based on the results of a preliminary study, student learning outcomes data was obtained at 37.04% in the low category. Thus, learning outcomes are significant to optimize to achieve learning goals.

Learning outcomes are primarily determined by students' understanding of the material taught at school (Dakhi et al., 2020). Learning material that is too complex causes students' understanding of the material to be lacking, resulting in low cognitive learning outcomes (Klepsch & Seufert, 2020). One of the subjects that is considered difficult is Biology (Reinhold et al ., 2020). Biology is an abstract and complex science (Alber et al ., 2019), so it requires a deep understanding of the concept when studied (Wang et al., 2023). Cognitive learning outcomes can be empowered by choosing a suitable learning model (Yarberry & Sims, 2021). Using appropriate learning models means achieving learning goals and student success (Faulks et al ., 2021).

One learning model that can potentially improve digital literacy and learning outcomes is Reading Concept Mapping Cooperative Learning (Remap-Coople) (Zubaidah et al., 2016). Remap Coople has the main characteristics of combining reading activities, creating concept maps, and cooperative learning models (Zubaidah et al., 2023). The cooperative learning model used in this research is the learning model Think Pair Share (TPS). According to Choirunnisa (2023), the

TPS learning model consists of thinking, pairing and sharing stages. Through pair discussions, each student can speak and share their ideas (Setiawan et al., 2020).

The research results of Mahanal et al. (2016) show that the Remap-TPS model of group division in pairs is more effective and tends to be less passive. In the learning process, the Remap-TPS learning model provides opportunities for all students to learn from each other and contribute actively by listening to each other and appreciating different points of view to understand better (Zubaidah et al., 2018). The Remap-TPS learning model can improve creative thinking skills (Tendrita et al., 2016), metacognitive skills (Antika, 2018), collaboration skills (Wanah et al., 2020), and student cognitive learning outcomes (Jatmiko et al., 2018).

The remap-TPS model is known to improve various skills but has limitations, namely that it could be more optimal in utilizing digital media as a learning resource (Narahaubun et al., 2020). The limitations of the Remap-TPS learning model can be complemented with the help of the Xmind application, which can help students visualize their knowledge after reading by compiling engaging and interactive concept maps (Astriani et al., 2020). Xmind is a software that can be used to create digital-based concept maps (Bhattacharya & Mohalik, 2020). The Xmind application can help students organize ideas and concepts of material through images, audio and video (Anas et al., 2022). Correspondingly Candera et al. (2022) explained that the Xmind application is very suitable for learning, with a percentage of 96. 02% (very high), but the Xmind app is still underused as an alternative learning media (Amelina et al., 2023).

Xmind application can visualize students' knowledge after reading by compiling digital-based concept maps (Suryani & Khairudin, 2020). Therefore, the Xmind application is suitable for application to Biology material because Biology material is abstract and complex (Huang et al., 2019). One of the biological materials that can be integrated with the Xmind application is the diversity of living things (Sizova et al., 2020). The material on the diversity of living things has indicators of analyzing and linking relationships and classifying living things, which are difficult for students to understand (Astuti et al., 2021), so making concept maps can help clarify the classification of living things based on their morphological and molecular characteristics (Bongard & Levin, 2021).

The remap-TPS learning model has been known to have much influence on science process skills (Fuadi et al., 2020), critical thinking skills (Zubaidah et al., 2018), creative thinking skills (Tendrita et al., 2016), and cognitive learning outcomes (Choirunnisa, 2023). However, these studies carried out concept maps manually, without utilizing the Xmind application to create digital-based concept maps. Apart from that, there has yet to be research examining the application of the Remap-TPS learning model using the Xmind application at SMA Negeri 9 Malang. Therefore, the Remap-TPS learning model, sisted by the Xmind application, can be an alternative learning model that can be used to improve digital literacy and student learning outcomes.

METHOD

This research is a quasi-experimental research by implementing the Remap-TPS learning model integrated Xmind application. The research design used was a pretest-posttest non-equivalent control group design, so a pretest was given at the beginning of the lesson and a posttest was given. This research was carried out at SMA Negeri 9 Malang, Jl. Puncak Borobudur No.1, Mojolangu, District. Lowokwaru, Malang City, East Java, Indonesia. This research was carried out for three months, namely August – October, in the odd semester of the 2023/2024 academic year. The population in this study were all class X students at SMA Negeri 9 Malang. The sample in this research was class X Science 3, which was used as the experimental class, and class X Science 4 as the control class. Details of learning activities are described in Table 1.

Table 1. Learning Activities

Model	Syntax	Material
Remap-TPS and Xmind	Remap-TPS learning stages are as follows: (1) Pre-Learning: Students carry out reading activities and prepare concept maps using the Xmind application; (2) students think individually (think); (3) students discuss with their partner (pair); (4) students share with classmates (share).	Biology material includes (1) the level of diversity of genes, species and ecosystem types, (2) the functions and benefits of the diversity of living things in Indonesia, (3) analyzing the causes of the disappearance of the diversity of living things, (4) threats to flora and fauna, (5) classification of living things based on their characteristics.
TPS	The TPS learning stages are as follows: (1) students think individually (think), (2) students discuss with their partner (pair), and (3) students share with classmates (share).	Biology material includes (1) the level of diversity of genes, species and ecosystem types, (2) the functions and benefits of the diversity of living things in Indonesia, (3) analyzing the causes of the disappearance of the diversity of living things, (4) threats to flora and fauna, (5) classification of living things based on their characteristics.

The instruments used in the research are instruments that experts have validated to measure digital literacy and learning outcomes. Validation was carried out by three experts in Biology education, experts in preparing research equipment and instruments, and Biology material experts. The average validation score is in the valid category (0.57). Data collection techniques are carried out through tests and observations. Digital literacy was measured using a questionnaire adapted from (Greenstein, 2012). Learning outcomes are measured using essay /description question instruments. The next stage is data analysis using the One-way ANOVA test on pretest-posttest scores with a significance level of 5% to determine the effect of the Remap-TPS learning model on digital literacy and student learning outcomes.

RESULTS AND DISCUSSION

Based on the research results obtained, they were analyzed using One-Way ANCOVA with the help of SPPSS version 24. The data that ANCOVA will test needs to be tested beforehand. Prerequisite test results include normality tests and homogeneity tests. The data normality test was carried out using the One-Sample Kolmogorov-Smirnov test. The data analyzed is based on the dependent variables measured, namely digital literacy and student learning outcomes.

The results of the normality test show that the significance value for the pretest and posttest for each variable is more significant than 0.05. The normality test results show that the significance value for the digital literacy pretest is 0.200 > 0.05, and the learning outcomes pretest is 0.08 > 0.05, which means the data is usually distributed. The significance value of the digital literacy posttest is 0.200 > 0.05, and the posttest learning outcomes are 0.183 > 0.05, meaning the data is usually distributed. These results indicate that the pretest and posttest data on digital literacy and learning outcomes are normally distributed. The results of the normality test can be seen in Table 2

Table 2. Normality Test Results with *One Sample Kolmogorov-Smirnov*

No	Variable	*Pretest*		*Posttest*	
		Significance	Information	Significance	Information
1	Digital literacy	0.200	Normal	0.200	Normal
2	Learning outcomes	0.08	Normal	0.183	Normal

The homogeneity test was carried out using Levene's Test of Equality of Error Variances. The data tested is based on digital literacy variables and learning outcomes. The homogeneity test results show that the significance value for the digital literacy pretest is 0.187 > 0.05, and the learning outcomes pretest is 0.671 > 0.05, which means the data is homogeneous. The significance value of the digital literacy posttest is 0.862 > 0.05, and the posttest learning outcomes are 0.160 > 0.05, meaning the data is homogeneous. The results of the homogeneity test can be seen in Table 3.

Table 3. Homogeneity Test Results with *Levene's Test of Equality of Error Variances*

No	Variable	*Pretest*		*Posttest*	
		Significance	Information	Significance	Information
1	Digital literacy	0.187	Homogeneous	0.862	Homogeneous
2	Learning outcomes	0.671	Homogeneous	0.160	Homogeneous

1) Results of Analysis of the Effect of Remap-TPS Assisted by Xmind on Students' Digital Literacy

The analysis of the influence of Remap-TPS, assisted by the Xmind application, on students' digital literacy shows a treatment significance value of 0.03 < 0.05, which means the research hypothesis is accepted. This shows significant differences in digital literacy between one class and another. The analysis test results can be seen in Table 4.

Table 4. One-Way Ancova Test Analysis Results on Digital Literacy

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1207.546a	2	603.773	12.897	.000	.272
Intercept	914.338	1	914.338	19,530	.000	.221
Pretest	232.199	1	232.199	4,960	.029	.067
Model	431.294	1	431.294	9,212	.003	.118
Error	3230.329	69	46.816			
Total	482191.000	72				
Corrected Total	4437.875	71				

a. R Squared =.272 (Adjusted R Squared =.251)

Based on the research results, it is known that the average value of cognitive learning outcomes for students in the experimental class and control class has increased. The increase in students' digital literacy scores in the experimental class was higher than in the control class. A comparison of the average scores of the initial test (pretest) and final test (posttest) of students' digital literacy in the experimental and control classes can be seen in Figure 1.

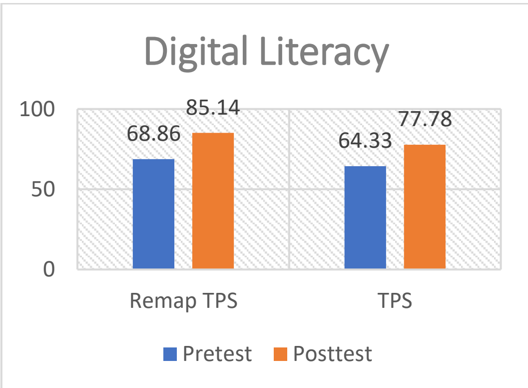

Figure 1. Comparison diagram of Average Digital Literacy Scores in the Experimental Class and Control Class

Based on the results of the percentage values based in Figure 1 shows that the average percentage value of digital literacy for students in classes taught with Remap -TPS is higher, namely 85.14% (perfect), than for students taught with TPS, which is 77.78% (good). Next, to see the results of the digital literacy percentage value for each digital literacy indicator, you can see in Figure 2.

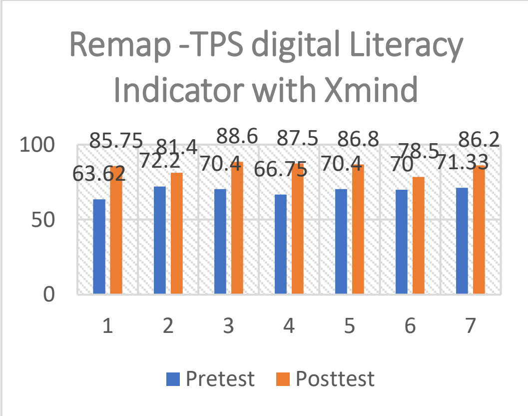

Figure 2. Comparison Diagram of Digital Literacy Indicators in Experimental Class (*Remap* -TPS)

Students who studied using Remap-TPS assisted by the Xmind application had a higher posttest percentage score than the pretest. The results of the percentage of students' digital literacy in indicators (1) ability to use technology was 85.75% (perfect), (2) device security ability 81.4% (perfect), (3) critical thinking ability 88.6% (perfect), (4) personal security ability 87.5% (perfect), (5) ability to search for information 86.8% (excellent), (6) communication ability 78.5% (good), and (7) ability to create products 86.2% (perfect).

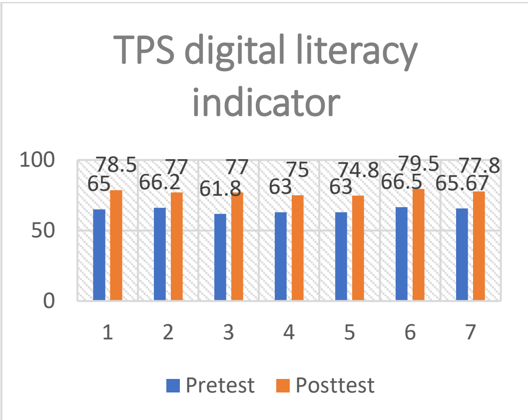

Figure 3. Comparison Diagram of Digital Literacy Indicators Control Class (TPS)

Figure 3 shows that the control class was implemented using TPS learning. The results of the percentage of students' digital literacy in the indicators: (1) Ability to use technology 78.5% (good), (2) device security ability 77% (good), (3) critical thinking ability 77% (good), (4) personal security ability 75% (good), (5) ability to search for information 74.8% (good), (6) communication ability 79.5% (good), and (7) ability to make products 77.8% (good).

2) Results of Analysis of the Effect of Remap-TPS assisted by Xmind on Student Learning Outcomes

The average value of students' cognitive learning outcomes is known based on the results of the initial test (pretest) and final test (posttest) of cognitive abilities in the experimental class and control class. The average initial and final test scores on students' cognitive learning outcomes in the experimental and control classes can be seen in Table 5.

Table 5. *One-Way Ancova* Test Analysis Results on Student Learning Outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3150.900 [a]	2	1575.450	48.215	.000	.583
Intercept	4804.239	1	4804.239	147.029	.000	.681
Pretest	4.011	1	4.011	.123	.727	.002
Model	3019.167	1	3019.167	92.399	.000	.572
Error	2254.600	69	32.675			
Total	472950.000	72				
Corrected Total	5405.500	71				

a. R Squared =.583 (Adjusted R Squared =.571)

Based on the research results, it is known that the average value of cognitive learning outcomes for students in the experimental class and control class has increased. The increase in the value of cognitive learning outcomes in the experimental class is higher than in the control class; however, the non-parametric T-test shows that the sig value for the experimental class and control class is 0.000 < 0.05 from the pretest and posttest data. A comparison diagram of the average of the initial test (pretest) and final test (posttest) of students' cognitive learning outcomes in the experimental and control class and control classes 4.

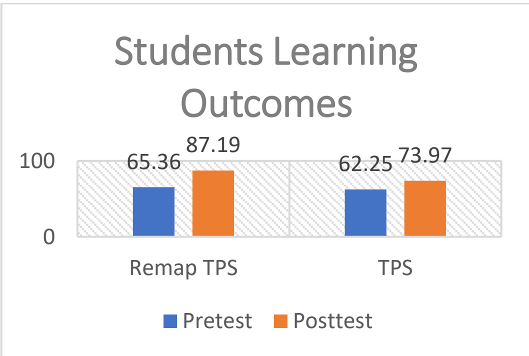

Figure 4. Comparison Diagram of Average Scores for Cognitive Learning Outcomes in The Experimental Class

Meanwhile, looking at the effectiveness value of students' cognitive learning outcomes using the average value of the N-Gain Score for the experimental and control classes. The N-Gain results show that the Remap- TPS class improved with an N-Gain of 0.61 (Medium). On the other hand, in classes taught using TPS, the N-Gain value is 0.28 (Low). The results of the N-Gain learning outcomes can be seen in Table 6.

Table 6. Average Digital Literacy and Student Learning Outcomes

Learning model	**Learning outcomes**	**Information**
	N-Gain *Score*	
Remap -TPS	0.6149	Currently
TPS	0.2898	Low

Discussion

Based on the research results, it show that there is a significant difference between digital literacy and student learning outcomes taught with Remap-TPS and TPS learning. This is indicated by the mean value of the Remap-TPS group being higher than that of the TPS group. The results of the N-gain analysis also confirmed that the increase in student learning outcomes tended to be higher in the group that took part in learning with Remap-TPS compared to the TPS group. Remap-TPS is an innovative learning model that refers to the Remap-Coople learning model developed by Zubaidah (2014).

Increasing digital literacy is strengthened through differences in answers from respondents' students' pretest and posttest on the material on the diversity of living things. The application of different learning models influences different digital literacy between student groups. Previous research supports this, stating that student digital literacy can be achieved through implementing appropriate learning models (Narahaubun et al., 2020). Apart from that, the effectiveness of technology integration in the learning process is an essential factor that encourages student motivation in honing digital literacy (Kivunja, 2015). Apart from that, the use of technology in learning can grow student participation from passive to proactive (Pala & Başıbüyük, 2023).

Digital literacy directly affects student learning outcomes (Noh, 2017). Digital literacy allows students to access information and utilize digital media as a practical learning resource to increase students' ability to gain new knowledge (Greenstein, 2012). Students with good digital literacy can be more critical in evaluating relevant information sources, avoiding inaccurate information, and using valid sources to learn (Noh, 2017). Apart from that, digital literacy has also been proven to increase the effectiveness of student learning because it makes it easier for students to use various digital tools and platforms that can be used in learning, such as e-*learning*, digital learning media, and educational applications (Littlejohn et al., 2012). In line with research by Rusdi et al. (2023), digital literacy skills positively correlate with student learning outcomes. Furthermore (Kim, 2019), digital literacy influences learning outcomes. Thus, digital literacy makes a positive contribution to student learning outcomes.

The increase in student learning outcomes in Remap-TPS is influenced by its syntax, which supports the development of digital literacy indicators (Jatmiko et al., 2018). The stages of implementation of Remap-TPS include reading, making concept maps, thinking, pairing and sharing. (Tendrita et al., 2016) . Implementation of the learning model refers to preparing a flow of learning objectives and teaching modules (Siregar et al., 2022). Students are also given Student Activity Sheets (LKS) adapted to the Remap-TPS activity stages, ensuring that students can participate in learning activities properly according to the LKS they get.

The stage of the Remap-TPS learning model is reading, which is done at home before starting learning in class. Students with suitable reading activities show greater readiness to participate in learning activities. The level of students' readiness is reflected in their active participation when asked questions by the teacher. Implementing learning using Remap-TPS provides more positive results when compared to the TPS learning model. This can be seen from the higher level of student involvement in responding to questions from the teacher during the learning process. Discussion sessions have also increased student activity in asking questions and providing answers. This is supported by previous research, which shows that reading can help students build knowledge (Setiawan et al., 2020; Jatmiko et al., 2018) so that they are more active in participating in the learning process (Bjorn et al ., 2022).

Reading ability is vital in studying Biology material (Fuadi et al., 2020), especially material on the diversity of living creatures, which requires in-depth analysis of the relationships between living creatures and their relationships (Ha & Lu, 2020). Apart from that, research on biodiversity continues to develop because many researchers are interested and continue to study biodiversity that has yet to be discovered (Huang et al., 2019). This indicates the importance of reading habits as research continues to develop. The reading process carried out by students in the experimental class (Remap-TPS) involves searching for and utilizing digital media to train students' digital literacy by creating concept maps. Thus, it can be used to prove that reading can improve material concepts and help st and structured material make concept maps.

The Remap-TPS learning model is making a map (Concept Mapping). Evidence that students have carried out reading activities well can be seen from the concept map that has been created. Making concept maps (Concept Mapping) reflects students' understanding of the material studied. The process of creating concept maps is based on the theory of meaningful learning proposed by Ausubel, which emphasizes student involvement in linking new information with relevant concepts so that it can shape students' cognitive knowledge (Ciechanowska, 2018). This approach gives students in-depth experience forming new knowledge concepts to increase their memory capacity (Getha-Eby et al., 2014). Kusumadewi Kusmaryono (2022) also supports this concept by emphasizing that concept maps are important in learning because they can visualize essential concepts and describe their relationships so they can represent the composition of the knowledge being studied.

Making concept maps in Remap-TPS learning has proven effective in increasing students' understanding of the material to be studied. This is supported by research by Weiwei (2017), which suggests that making concept maps involves understanding reading, analysis, information synthesis and representation. Analysis of the information presented in concept maps can train students to manage digital media as a learning resource (Mohaidat, 2018). Digital-based concept maps are more effective than manual ones (Bhattacharya & Mohalik, 2020). Therefore, digital-based concept map creation methods can improve students' digital literacy.

One application that can support the creation of digital-based concept maps is the Xmind application (Nair & Farei, 2017). The advantage of Xmind lies in its easy-to-understand use because it has user-friendly features (Wangz et al., 2021). This application also facilitates collaboration because it is integrated with other applications such as Microsoft Office, Evernote, and Google Drive, making it easier for students and teachers to import and export data between different applications (Mohaidat, 2018). Apart from that, Xmind is also equipped with features in text, images, animations, and videos, which can be used to clarify concepts in Biology material that tend to be abstract and complex (Candera et al., 2022).

One of the biological materials that can be suitable to be represented with a concept map is the diversity of living things (Bongard & Levin, 2021). The diversity of living things involves a complex and detailed hierarchy, which includes from the highest level domain to the lowest level species (Narahaubun et al., 2020). Xmind can help students visualize reading results regarding the diversity of living things (Nair & Farei, 2017). An example of a digital-based concept map created by students on the subject of the diversity of living things using the Xmind application can be seen in Figure 5.

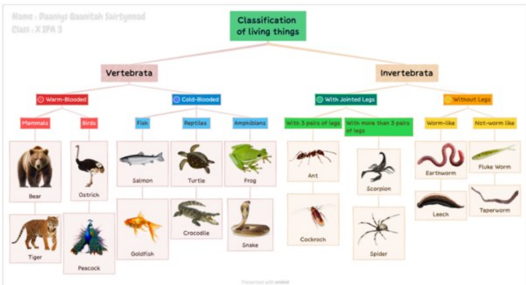

Figure 5. Student Concept Mapping on the Diversity of Living Things' Material Using the Xmind Application (Source: Authors' own Concept Mapping, 2023)

Biology material in the form of concept maps is more accessible for students to understand to remember essential concepts (Bulić et al., 2017). A good concept map represents understanding the concepts of material studied in reading activities and accessing relevant information (Zubaidah et al., 2023). A good understanding of material concepts can improve student learning outcomes. This aligns with the results of the One-Way ANCOVA analysis showing that Remap-TPS affects student learning outcomes. Apart from that, the N-gain results show a more significant increase in the learning outcomes of students who are taught using Remap-TPS compared to students who are taught using TPS learning. The results of this research are in line with the results of previous research conducted by Setiawan et al. (2020), Zubaidah et al. (2018), Wanah et al. (2020), and

Zubaidah et al. (2023), which state that Remap combined with various types of Cooperative Learning can influence in improving student learning outcomes.

Remap-The TPS learning model has been proven to provide many specific advantages (Tendrita et al., 2016). In its implementation, several obstacles are still encountered during the learning process. First, students tend to access other applications such as Instagram, Twitter, TikTok, and so on, which can result in a lack of full participation in a series of learning processes. Second, the Remap-TPS learning model involves a series of activities that require quite a long time, especially when students are involved in discussions and conveying ideas, thus allowing for differences of opinion and finding solutions to mutually agreed upon problems. Therefore, to overcome these obstacles, it is recommended to consider using time efficiently, controlling student activities, and involving supervisors (observers) who can help monitor more closely during the learning process. Hopefully, these steps can increase the effectiveness of implementing the Remap-TPS Learning Model to achieve learning objectives better.

CONCLUSION

The research results show an influence on digital literacy and student learning outcomes, implemented using the Remap-TPS learning model integrated with the Xmind application. This research indicates that the Xmind integrated Remap -TPS learning model significantly improves digital literacy and student learning outcomes more than the TPS learning model. Therefore, this research can be an alternative solution to improve digital literacy and student learning outcomes.

Future research could consider integrating digital media-based concept map applications, such as MindMeister, Cogglem, Mindomo, Biggerplate, and Canva, as a broader use of digital media. Further research can involve other variables that enrich students' skills in the current digitalization era.

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