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Effects of Remap-TPS Using Wizer.Me Website and Mindmap Application on Students' Cognitive Learning Results

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ABSTRACT

This study aims to determine the *Remap-TPS* learning model assisted by the *Wizer.me* website and the *MindMup* application on students' cognitive learning outcomes. This quasi-experimental study used a *non-equivalent pretest-posttest control group design*. The population of this research ~~is~~ was all students of class XI SMA Negeri 8 Malang. The research sample was class XI MIPA 3 as the experimental class and class MIPA 4 as the control class. Cognitive learning outcomes data were obtained from the results of multiple-choice tests and essays. Data were analyzed using the o*ne-way Anacova* test. Based on the results of the study, it was shown that *Remap-TPS* learning assisted by the *Wizer.me* website and the *MindMup* application affected students' cognitive learning outcomes.

The emergence of the Covid-19 pandemic has affected the entire world, including Indonesia, primarily in the field of education (Kurniawan & Kristin, 2022; Nirmayani, 2022; Nurbayani et al., 2021). Consequently, all learning processes are carried out online through systems of distance learning (Hacatrjana, 2022; Nurbayani et al., 2021), resulting in new issues for teachers and students due to their minimum preparation (Fauzi et al., 2021). For this online learning, teachers have to adjust their lesson plans (Fauzi et al., 2021). Additionally, several teachers have a low ability to operate the technology devices used in the teaching and learning processes (Nirmayani, 2022; Ramadhani, 2020).

Distance learning also induces students' low reading interest and deficient conceptual mastery. Additionally, students' reading is a crucial skill as it aids students in comprehending and attaining information from their reading (Hayati et al., 2020; Sari, 2020). Meanwhile, Hayati et al. (2020) described that reading interest affects education quality, especially in students' thinking skills which later impacts students' learning outcomes. Sari (2020) added that high reading skills improve students' knowledge and learning results. In contrast, students' low reading skills result in inadequate knowledge and learning outcomes. Learning outcomes illustrate students' learning results after they complete the learning processes (Tendrita et al., 2017). Many lessons require students' high conceptual understanding and reading skills, such as in Biology courses.

Biology course aims to extend students' conceptual understanding, which facilitates students to connect and describe a concept of an event (Khairaty et al., 2018). Additionally, during learning, misconception obstructs students' understanding of Biology material understanding (Khairaty et al., 2018), which commonly requires students to memorize and understand concepts, along with scientific terms. It frequently becomes one of the challenges faced by students in understanding the materials (Anggraini et al., 2016). Our observation of students' initial test results showed an average student score of 58.52, classified as low. Thus, students still need empowerment in this course. Sukardi et al. (2015) described that students' difficulties in understanding Biology concepts reduce their learning outcomes.

During the Covid-19 pandemic, all online learning processes are carried out using supporting technology devices (Allo, 2020; Basilaia, 2020) to achieve learning purposes (Fauzi et al., 2021; Lathifah et al., 2021; Nurbayani et al., 2021). Therefore, teachers need to use efficient and effective media to aid their learning material delivery (Kurniawan & Kristin, 2022). Currently, many effective online learning platforms are available, such as the Wizer.me website and the Mindmup application. Wizer.me website is an online software for designing interactive multimedia worksheets (Kopniak, 2018). The Wizer.me-based worksheet examines teachers' creativity and experience in constructing students' worksheets (Kaliappen et al., 2021; Safitri & Mulyani, 2022). Wizer.me is an alternative to interactive online students worksheet reported to aid online learning processes (Kopniak, 2018; Ratnawati, 2021). Safitri & Mulyani (2022) reported that Wizar.me is a practical website offering numerous features for

constructing questions in the form of multiple choices, short answers, picture descriptions, clarification, drawing, matching, and word puzzles (Putri & Delia, 2021). In addition, the MindMup application is an alternative application that can be used to enhance students' conceptual mastery and lower their misconceptions about Biology courses (Hanifah et al., 2015). Yuniarti (2016) defined MindMup as groupware that can be used to arrange information into a mind map. Meanwhile, the mind map is a summarizing technique in the form of a graphic or map that accelerate information understanding. (Astriani et al., 2020) define a mind map as a reflective instrument that enables students to create an image and experiment with color in mapping the materials.

Setiawan et al. (2020) reported the success of remap (reading concept map) learning and cooperative learning model, one type of constructivism learning, in enhancing students' reading interest and conceptual mastery (Pangestuti et al., 2015; Setiawan et al., 2020; Zubaidah, 2014). Additionally, think pair share (TPS) is one of the cooperative learning models focusing on facilitating students' active participation in the learning process (Johnson & Johnson, 2014). Surayya et al. (2014) reported that TPS learning affects students' learning results, while another study reported that Remap-TPS correlated with students' metacognitive skills and learning achievements (Antika, 2018). Another research also investigated the capacity of Remap-TPS to improve students' critical thinking skills, metacognitive skills, learning outcomes, and reading interests (Tendrita et al., 2017). Another study carried out by Jatmiko et al. (2018) uncovered that Remap-TPS improved students' scientific attitudes and cognitive skills.

The syntax of our Biology learning based on Remap-TPS using Wizer.me website and MindMup application consisted of six stages. First, students read the material at home. Second, they were asked to make a mind map using the MindMup application based on their reading. Third, the students answered questions through the Wizer.me link in the classroom. Fourth, students answer the questions independently. Fifth, students sit in pairs to discuss and conclude their answers. Sixth, present their group answers to other groups. Therefore, this study aims to identify the effects of the Remap-TPS learning model using Wizer.me and MindMup application on students' cognitive learning outcomes.

METHOD

This quasi-experiment study used a non-equivalent pretest-posttest control group design. It was completed from September to October 2022 in State Senior High School 8 Malang, Indonesia. Our research population was from six classes of eleventh-grade students. Further, the samples were chosen through simple random sampling following the results of the One-Way Anova Equivalent test. In the end, we involved 28 students from eleven science three classes as our experiment class given the Remap-TPS learning model and Wizer.me website. Meanwhile, 33 students from eleven science four classes participated as the control group and attended learning using the TPS learning model. For the instrument, we used multiple choice and essay tests. Then, the obtained data were analyzed using the One Way Anacova test.

RESULTS

The results of *Anacova* on Biology learning using Remap-TPS with Wizer.me website and MindMup application are presented in Table 3. The sig < 0.05 suggested that the research hypothesis was accepted, while sig > 0.05 indicated that the hypothesis was rejected. Before the Anacova test, we also carried out the prerequisite test, consisting of normality and homogeneity test. The results of the normality test are presented in table 1, while the results of the homogeneity test are shown in table 2. Meanwhile, the corrected mean value for the Remap-TPS learning with Wizar.me website and MindMup application toward the cognitive learning results are summarized in table 4.

Table 1. Summary of *Kolmogorov-Smirnov* Test on Students' Cognitive Learning Outcomes

	Statistic	Df	Sig.
Residual for YHBK	,076	61	,200*

The results of the *Kolmogorov-Smirnov* test confirmed that the residual data from students' cognitive learning results were distributed normally [$D(61) = 0{,}076$, $p = 0{,}200$].

Table 2. Results of Levene's Test on Students' Cognitive Learning Outcomes

F	df1	df2	Sig.
,126	1	59	,724

Results of Levene's test indicated that the data variance on cognitive learning results between the experiment and control group were distributed homogeneously [$F(1,59) = 0{,}126$, $p = 0{,}724$].

Table 3. Results of Anacova Analysis on Students' Cognitive Learning Results

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	61.200[a]	2	30.600	7.161	.002	.198
Intercept	4491.264	1	4491.264	1051.081	.000	.948
XHBK	43.494	1	43.494	10.179	.002	.149
Kelas	20.727	1	20.727	4.851	.032	.077
Error	247.834	58	4.273			
Total	441146.241	61				
Corrected Total	309.034	60				

a. R Squred = .198 (Adjusted R Squared = ,170)

The Anacova test results showed that the different learning model implementation results in significantly different cognitive learning results between the control and experiment group, with the initial cognitive learning results being controlled [$F(1,58) = 4{,}851$, $p = 0{,}032$, $\eta p^2 = 0{,}077$].

Table 4. Results of Corrected Average Calculation from the Learning Model toward Cognitive Learning Outcomes

Class	*Pretest* ± SD	*Posttest* ± SD	Difference	Increase	Corrected Average	Notation
Experiment	55,37 ± 6,51	85,60 ± 2,35	30,23	54,60%	85,645	a
Control	56,04 ± 6,14	84,51 ± 2,11	28,47	50,80%	84,473	b

As listed in table 3, the obtained F_{count} was 4.851 with a significant level of 0.032 < 0.05. Thus, the research hypothesis was not rejected, showing the effects of the learning model on the cognitive learning results. Our analysis suggested that the learning model results in distinct cognitive learning outcomes.

Table 4 shows the corrected average calculation results on the cognitive learning outcomes, signifying that students attending the learning with the Remap-TPS model with Wizer.me website and MindMup application attained greater scores than the students learning using the TPS model only. The corrected average cognitive learning outcomes from students in Remap-TPS class with Wizar.me website and MindMup application were 85.645, while in the TPS class, the students' learning outcome was 84.473. Thus, Biology learning with the Remap-TPS model with Wizr.me website and MundMup application increase students' cognitive learning results, as illustrated in figure 1.

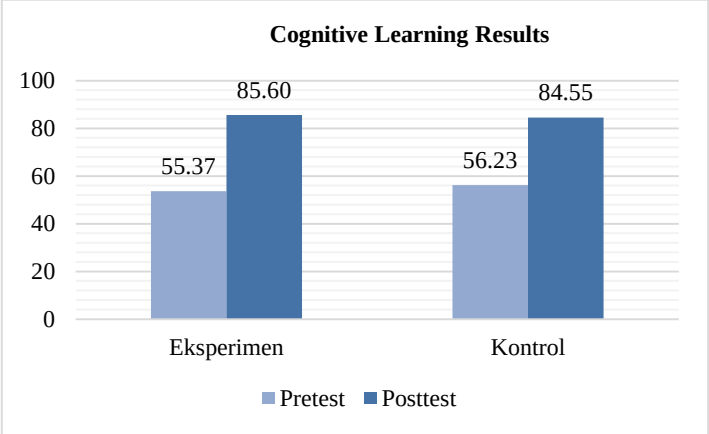

Figure 1. Students' Cognitive Learning Improvement

DISCUSSION

Our results of data analysis showed that the remap-TPS learning with Wizer.me and MinMup application significantly influenced the cognitive learning results. The corrected average value on the cognitive learning results of students attending the Remap-TPS learning with Wizer.me website and MindMup application is higher than students' with the TPS model only. Accordingly, the Remap-TPS learning model with Wizer.me website and MindMup application enhances students' cognitive learning results.

The increase in students learning results is caused by the Remap-TPS syntax, which starts with a reading activity. Through reading, students gather new knowledge, improve their memory, train their thinking skills, and expand their knowledge (Ester et al., 2022). Besides, it also accelerates their understanding (Tavsancil et al., 2019). Zubaidah et al. (2018) described that in reading activities, students are expected to present excellent skills in comprehending implied meaning, the

causality relationship between an event and an action, as well as differentiating facts from opinions. Besides, by reading, students can find the keywords of the text, as well as summarize and arrange questions based on the text to help them accelerate their learning results (Tendrita et al., 2017).

In our study, the learning processes consisted of summarizing and creating a map concept. The map concept is a graphic instrument that reflects the connection between particular concepts, developed in a hierarchy order (Zubaidah et al., 2018). After the reading activity, the students have to write down the obtained information in the form of a structured map concept(Handoko et al., 2016). Meanwhile, Cheema & Mirza (2013) uncovered that the map concept aids students in clarifying a concept. Besides, a map concept helps students integrate their knowledge in the form of a chart in comprehending a concept, thinking, and learning (Villalon & Calvo, 2011), affecting their cognitive learning results (Hu & Wu, 2012). In the current 21st-century learning, technology bears an essential role in advancing students' knowledge to support the realization of 21st-century skills. Therefore, the creation of a mind map should be carried out using technology and application programs, such as i-Mind Map, Freemind, Mind Manager, Cmap Tools, MindMup, and other applications (Handoko et al., 2014). An example of a student's mind map created using the MindMup application is presented in figure 2.

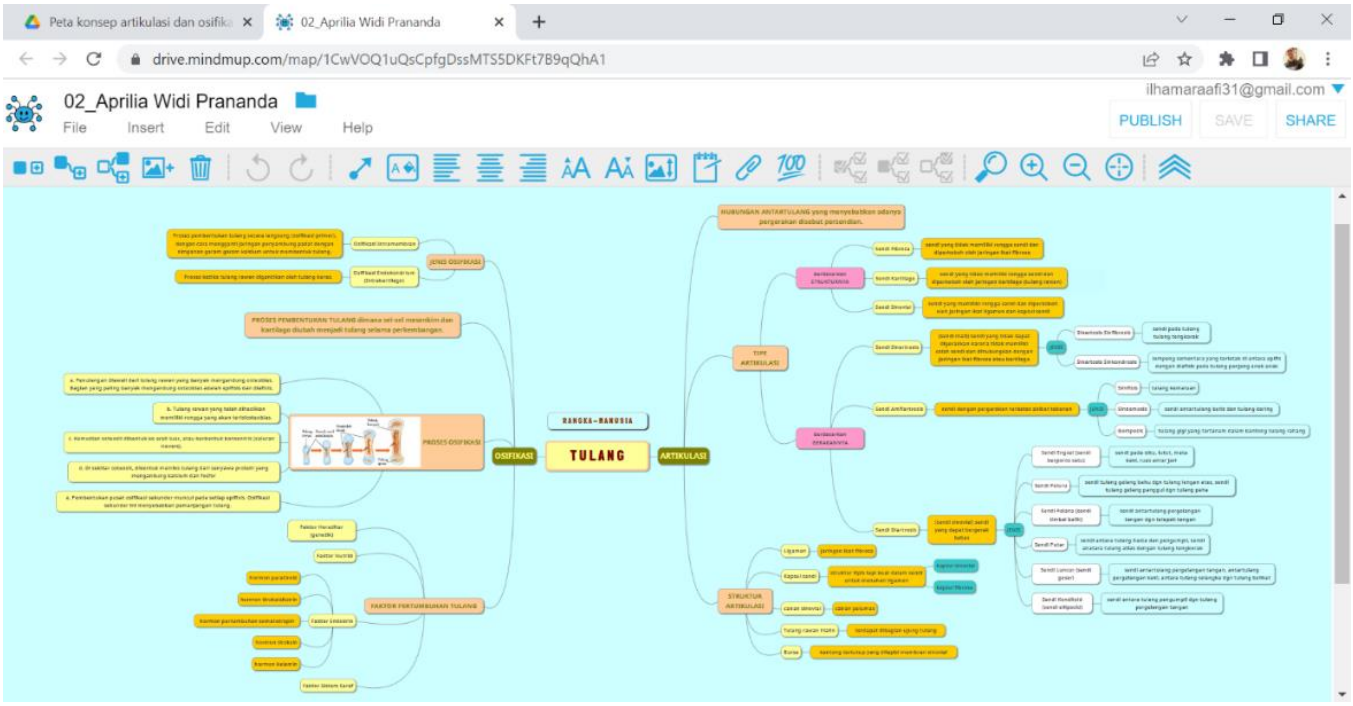

Figure 2. One of the Students' Mind Map Created Using MindMup

In this study, the learning process was carried out using the TPS learning model using Wizer.me website. The TPS learning model is cooperative learning that involves students and facilitates them to think independently. Then, these students work in a pair to discuss their newly identified information, knowledge, or ideas, as well as share other thinking in the classroom (Tendrita et al., 2016). The TPS model using Wizer.me website is an alternative learning media in the form of interactive online students' worksheets during the Covid-19 pandemic. This combination of the learning model and website has been reported to increase students' cognitive learning outcomes (Sobri et al., 2022). Meanwhile, Rohmah (2022) described that this interactive online student worksheet could improve students' learning outcomes. Additionally, interactive online students worksheet, such as Wizer.me, can also be implemented in blended learning (a combination of online and face-to-face learning) (Mulu et al., 2022). The display of interactive online students worksheet based on Wizer.me website is presented in figure 3. Meanwhile, the example of features offered by Wizer.me is the Blanks feature, as shown in Figure 4. As shown in Figure 4, teachers can provide a short text related to muscle contraction mechanisms that will be discussed, or the teachers can also erase some keywords to train students understanding.

Figure 3. Example of Students Worksheet Based on Wizer.me Website with Fill on an Image Feature

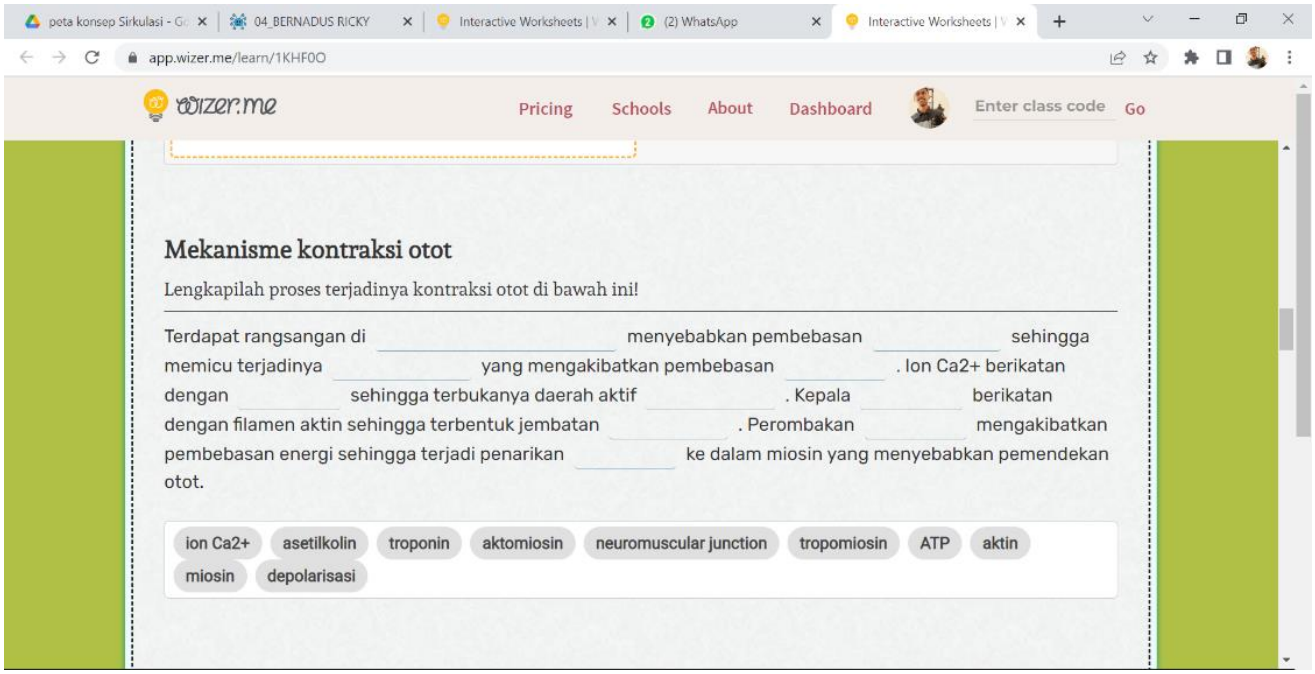

Figure 4. *Blanks* Feature on *Wizer.me* website

In addition, students' higher cognitive learning outcomes can be induced by the implementation of the TPS learning model. The first stage in TPS is the thinking stage, where teachers provide a question, along with the chance for students to answer the question and find the solution independently. Through the thinking process, students can develop their skills. Further, it aids students in progressing their skills in explaining the text and actively participating in the learning process (Tendrita et al., 2017). Razzouk & Shute (2012) described that the thinking process eases students to solve their problems, so it prepares students to face issues using the innovative solution. Meanwhile, Farkhati & Sumarti (2019) & Mispa et al. (2022) suggested that electronic learning media, such as interactive students worksheet, help students to participate in the classroom actively, not

get bored, and have independence. Further, these benefits are also enhanced by the use of Wizer.me website, which offers various different features to help students avoid boredom during learning (Putri & Delia, 2021). Aside from giving opportunities to learn independently, cooperation during the learning process also impacts the learning outcomes (Surayya et al., 2014).

The second stage is pairing. In this phase, students discuss to synchronize their understanding and compare their ideas. Through this discussion, students train their responding skills on a small scale before presenting their opinion in front of the class. Besides, they also exchange opinion, ideas, and thought to answer the question. Discussion is reported to enhance thinking skills in understanding a material comprehensively (Tendrita et al., 2016). According to Tendrita et al. (2017), discussion aided students' focus in understanding a material that is about to be deliberated and improved students' high-order thinking skills. After the discussion, students share their answers with other groups through a presentation.

The last stage of the TPS method is sharing. In sharing, students present their work to disseminate their pair discussion results with other groups. In this stage, every group can evaluate one another, enabling them to measure their cognitive activities (Nurnawati et al., 2012). Additionally, students also have the opportunity to respond to or give questions to other groups (Rosita & Leonard, 2015). Teachers can also evaluate students' answers in this stage while giving reinforcement at the end of the learning process. Reinforcement at the end of the learning process is vital as it helps students perceive the concepts as meaningful and accelerate their learning motivation (Nurnawati et al., 2012).

The benefits offered by technology-based learning include reduced usage of papers which enhances environmental preservation and enhance students' technological literacy, so students are ready to compete in the 4.0 era. However, this study also presents a number of limitations. First, the use of Wizer.me as a student worksheet requires teachers to be coherent, and they have to consider the types of questions included in the worksheet. Second, the students' worksheet is only used on the movement system learning material.

CONCLUSIONS

Our analysis results suggested differences between students attending the learning process using the Remap-TPS model with Wizer.me website and MindMup application and students attending the TPS learning. Following our analysis results, the Remap-TPS model with Wizer.me website and MindMup application can be proposed as a learning model alternative to enhance students' cognitive learning results. The use of an interactive worksheet based on Wizer.me can also be applied to other Biology materials.

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