



The Effect of Picture and Picture Integration with Guided Note Taking accompanied by Optimization of Teaching Aids Towards Students Learning Outcomes

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Abstract: The objective of this study is to determine the impact of the Picture and Picture application integrated with Guided Note Taking (GNT) on students' biology learning achievement by optimizing teaching aids. The study is categorized as a quasi-experiment. The research design used is Post-test Only Control Group Design with group experiment, which implements Picture and Picture application coupled with Guided Note Taking (GNT) through the optimization of the use of teaching aids, and control group, which implements discussion technique, speech, and presentation. The population of the research is students of class XI IPA (grade 11 in Natural Science) from Public Senior High School (SMA N) 2 Boyolali. The sample in the research is students of class XI IPA 4 as the experiment group and students of class XI IPA 3 as the control group. Cluster random sampling was used to collect the sample. Multiple-choice tests, questionnaires, observation forms, and documentation are used to collect data. The t-test was used to test the hypothesis. This study concludes that Picture and Picture application integrated with Guided Note Taking (GNT) through the optimization of teaching aids utilization affects students' biology learning achievement in cognitive, affective, and psychomotor domains.

Keywords: Guided Note Taking; Learning Outcomes; Picture and Picture; Teaching Aids

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Introduction

The most crucial need in human life is education. Education teaches us how to think, work, and make the best decisions possible (Bano, 2015). Essentially, education is a socially regulated process that begins with the transfer of. experience or information from past generations to the next (Naziev, 2017). According to the Law of the Republic of Indonesia No. 20 of 2003 concerning the National Education System Chapter 1 Article (1), education is a conscious and planned effort to create a learning environment and learning process in which students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills required by himself, society, nation, and state.

Meanwhile, the development of students' self-potential necessitates a directed and planned learning process to obtain educational goals (Amaliyah & Rahmat, 2021). Efforts to change and improve education in order to enhance the quality of Indonesian education are urgently demanded.

Efforts to enhance education quality must begin with the individual, particularly instructors and students. Learning and the learning process are critical aspects to consider. This is due to the fact that the learning process can produce behavioral changes in students. A succession of cognitive, emotional, and psychomotor processes of students in the classroom can reveal changes in student behavior (Herawati, 2018). Piaget emphasizes that teacher should obviously provide opportunities for learners to explore and

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experience, by doing so is encouraging learner's new understandings. The opportunities that allow learners of different cognitive levels to work together and encourage less mature students to advance to create understanding (Bashrin, 2015). Piaget argued that children construct their own knowledge from their own experiences with the environment. In Piaget's view, knowledge comes from action, cognitive development largely depends on how far the child actively manipulates and actively interacts with his environment (Lefa, 2014). Therefore, a good teacher is expected to be able to master various learning models, methods and be able to develop innovative learning media so that they can facilitate students in achieving learning goals. The selection of learning models, methods, and media depends on various factors such as the characteristics of learning materials, student characteristics, facilities and infrastructure, mastery/learning experience (Hikmawati, Kusmiyati, & Sutrio, 2020). Learning outcomes refer to the process of behavior change that occurs as a result of this learning experience. Behaviorism focuses on the idea that all behaviors are learned through interaction with the environment. This learning theory states that behaviors are learned from the environment, and says that innate or inherited factors have very little influence on behavior (Muhajirah, 2020).

Biology is a field of science that investigates living organisms and their vital activities, therefore understanding biology is essentially a combination of three components of science: biology as a process, biology as a product, and biology as a scientific attitude (Widyasari, Pratama, & Prayitno, 2013) Learning biology is essentially an endeavor to improve one's cognitive abilities, attitudes, and science process skills. As a consequence, biology learning should be organized to allow students to discover facts, construct concepts, and discover new values using the scientific method, often as scientists do (Susdarwono, 2021). Based on the preceding definition, it is obvious that learning biology emphasizes the process skills method for students to discover facts, construct concepts, theories, and develop scientific attitudes.

As per data from the 2018 PISA (Program for International Student Assessment), only 40% of pupils in Indonesia under the age of 15 can recognize correct explanations for known scientific phenomena, and can apply this knowledge to solve simple issues (OECD, 2018). These findings suggest that Indonesian students' scientific literacy, as measured by their ability to comprehend scientific phenomena and apply knowledge to solve simple issues, is rather low. Meanwhile, biology education has thus far focused solely on memorizing facts, concepts, and ideas, leaving pupils less engaged in both thinking and social activities. In science learning, the desired expectations

emphasize the provision of direct experience (Wenno, 2008). To prepare for this, biology learning must be developed in such a way that students are actively involved in learning activities to find and apply their ideas, and students are expected to gain hands-on experience.

Picture & Picture is an active learning technique that uses pictures to attract students' attention to the topic being studied (Kurniasih & Sani., 2015). The Picture and Picture learning approach makes use of visuals as a learning medium. In the learning process, these images become the most important aspect (Baransano, Yohanita, Damopolii., 2017). Picture and Picture is a teaching method in which the teacher provides pictures related to the material, instructs students to arrange the pictures in a logical order, inquiries about the reason for the arrangement of the pictures, and then instructs the students to instill the concept in accordance with the competition to be completed (Musyafa, 2020). Based on research conducted by Hilal, (2021), the learning process using the Picture and Picture method can increase the activeness and learning outcomes of science. The Picture and Picture method can increase interest and motivate students, so students will be more enthusiastic and play an active role in participating in the learning process (Baransano, Yohanita, Damopolii., 2017).

One of the active learning tactics used to help deliver teaching materials is guided note-taking (GNT) or guided notes. Guided Note Taking uses a handout to summarize the key points of a lecture (Silberman, 2009). The use of Guided Notes begins with the instructor's learning activities, which include giving handouts that students can use as a guide while the teacher delivers learning materials. Simple and simple directions are included in the handout so that they can be filled with information, concepts, and correlations in biology learning (Heward, 1994).

Picture and Picture learning, together with Guided Note Taking, will be created as an alternate learning method in which students are urged to remain active in their thoughts and social interactions. Picture and Picture Learning combined with Guided Note Taking, will be supplied with teaching aid optimization in the hopes of improving student biology learning outcomes and making biology classes easier to understand.

Teaching aids are tools used in the teaching and learning process to clarify the concepts and theories of learning material. The existence of teaching aids can increase motivation and stimulate students to be more active so that learning conditions will become more interactive and not seem monotonous (Masyruhan, Pratiwi, & Hakim, 2020). In other words, the existence of teaching aids is expected to make it easier for students to understand biological concepts, real objects,

or model objects that are very similar to real objects will provide a very important stimulus for students to learn tasks involving psychomotor skills (Anderson, 1987). Trisdiono, (2015) states that if in the learning process students' attention is focused on the message being studied, then the process and learning outcomes will be better.

Picture and Picture learning, when combined with Guided Note Taking and the best use of teaching aids, is predicted to be an alternate learning method utilized by teachers in the classroom to increase students' knowledge of biological concepts and hence their learning results.

Based on all of the above explanations, this study was undertaken to determine whether or not introducing Picture and Picture learning, along with Guided Note Taking and maximizing the usage of teaching aids influenced student biology learning outcomes.

Method

The research was conducted at SMA Negeri 2 Boyolali in the even semester. This research is a quasi-experimental research design with Posttest-Only Control Group Design. The population in this study were all students of class XI IPA (grade 11 in Natural Science) from Public Senior High School (SMA N) 2 Boyolali. The sampling technique used is cluster random sampling. The results of the group selection randomly obtained class XI IPA 3 as the control group and class XI IPA 4 as the experimental group. The control group consisted of 28 students using the lecture learning method with discussions and presentations. The experimental group consisted of 28 students using the Picture and Picture learning method integrated with Guided Note Taking accompanied by optimizing the use of teaching aids. The independent variable in the form of Picture and Picture learning is integrated with Guided Note Taking accompanied by optimizing the use of teaching aids and the dependent variable is the student's biology learning outcomes.

Data collection techniques used in this study include tests, documentation, observation and questionnaires. The test technique is used to measure student learning outcomes in the cognitive domain. The form of the test in this study was in the form of multiple-choice questions as many as 25 questions. The initial data used for the balance test in this study is in the form of a list of grade 11 test results in the biology subject from the odd semester. The observation technique in this study was used in Guttman scale with a scale of Yes (1) and No (0) to measure learning outcomes in the psychomotor. The psychomotor domain includes reflex movements, basic movement skills, perceptual ability, harmony or accuracy, complex

skills, and interpretive expressive movements. Questionnaire technique is used to collect data on learning outcomes in the affective domain and categorized based on a Likert scale of 1-5 1 = strongly disagree, 2 = disagree, 3 = elements, 4 = agree, and 5 = strongly agree. The affective domain includes five levels of ability, namely receiving, responding, valuing, organization, and characterization by a value (Sudjana, 2013).

Cognitive test tests were performed to determine the research instrument test's validity, reliability, discriminating power, and difficulty. The questionnaire test was carried out to determine the instrument's validity and reliability. The instrument was not only tested, but it was also validated by experts. The t test was used to analyze data in this study. The prerequisite tests include the Kolmogorov-Smirnov test for normality and the Levene's test for homogeneity.

Result and Discussion

Before testing the hypothesis, the normality and homogeneity of the data were tested. The results of the significant normality test were determined by Kolmogorov-Smirnov. For the data normality test can be seen on Table 1.

Table 1. The normality test result

Domain	Class	Sig
Cognitive	Control	0.084
	Experiment	0.499
Affective	Control	0.898
	Experiment	0.991
Psychomotor	Control	0.084
	Experiment	0.237

Table 1 shows that the results of the normality test of the student's biology learning achievement test data value Sig > 0.050 in the control and experimental groups in the cognitive, affective and psychomotor domains. It can be concluded that all data in this study came from a normally distributed population. Meanwhile the homogeneity test that were determined by the Levene's test can be seen on Table 2.

Table 2. The homogeneity test result

Domain	Class	F _{count}	Sig	F _{table} (α;df1;df2)
Cognitive	Control and experimental	2.452	0.123	4,019
Affective	Control and experimental	3.593	0.063	4,019
Psychomotor	Control and experimental	0.192	0.663	4,019

Table 2 shows that the value of Sig > 0,05 and the value of $F_{Levene's} \leq F_{tabel(0,050;1;54)}$, it can be concluded

that H0 is accepted. This shows that all data come from populations whose variances are homogeneous both in the cognitive, affective and psychomotor domains. Then Table 3 shows the results of data analysis on the effect of implementing Picture and Picture learning integrated with Guided Note Taking, as well as optimizing the use of teaching aids, on biology learning outcomes.

Table 3. PAP+GNT learning accompanied by optimizing the use of teaching aids for biology learning outcomes.

Domain	T	f	Sig	t _(α,df)
Cognitive	3.454	4	0.001	2.005
Affective	2.112	4	0.039	2.005
Psychomotor	3.595	4	0.001	2.005

Table 3 shows that all $t_{count} > t_{(α,df)}$ and $sig < 0,050$, so that H₀ rejected in all areas of learning outcomes. This informs that the application of Picture and Picture learning integrated with Guided Note Taking and accompanied by optimization of the use of teaching aids is significantly affect biology learning outcomes in the cognitive, affective and psychomotor domains.

Biology learning outcomes were higher in the experimental group that used the Picture and Picture learning method integrated with Guided Note Taking and optimizing the use of teaching aids in learning, than in the control group that used the lecture method with discussions and presentations. This effect is due to learning about the human reproductive system using the Picture and Picture learning method combined with Guided Note Taking, as well as optimizing teaching aids, which provided several new aspects not found in the control group.

These aspects are summarized in the Picture and Picture learning steps which include: 1) delivering competence, 2) presenting introductory material, 3) showing pictures, 4) installing pictures into a logical sequence, 5) asking the reasons for installing pictures, 6) build their own learning concepts with the reasons for installing pictures, and 7) conclusions (Suprijono, 2011). Guided Note Taking, which optimizes the use of teaching aids to make students more engaged in thinking and socially in learning and able to increase learning outcomes in cognitive, affective, and psychomotor biology, is added to the stage of planting learning concepts in this sixth step.

The results of observations in biology learning using the Picture and Picture learning method combined with Guided Note Taking and the optimization of teaching aids show that Picture and Picture learning can improve student learning activities, because it allows students to be actively involved socially during learning activities. Students must paste pieces of paper according to the proper

picture and must first discuss how to solve the problem of pasting the picture, ensuring that students do not have the opportunity to stay silent and that they remain engaged in their learning. Pebriana et al., (2017) also stated that groups employing Picture and Picture are able to boost motivation, which leads to increased learning activities. This transformation in learning at the sixth stage of Picture and Picture from teacher-led concept planting to student-led concept building reinforces the fact that biology is the essence of science, emphasizing constructivism, in which knowledge is not a set of facts, concepts, or rules that students must accept and remember. Students, on the other hand, who must develop their own expertise (Sugrah, 2020).

The integration of Guided Note Taking at the sixth stage of Picture and Picture is intended so that students remain active in thinking in participating in learning because students build their concepts, provide opportunities for self-development, focus on handouts and the material being studied so that they can solve their problems by finding (discovery) and working on their own. Masyruhan, Pratiwi, & Hakim (2020) strengthens the statement that Guided Note Taking can make students more active in responding during learning. Optimization of teaching aids in schools is also able to increase students' attention, students are more active in learning such as asking questions, observing, and expressing opinions.

Students also gave a positive response to Picture and Picture learning integrated with Guided Note Taking accompanied by optimization of teaching aids, which showed that 75% of students were happy with the learning atmosphere with this method. Another statement shows students' interest in the Picture and Picture learning process integrated with Guided Note Taking accompanied by optimization of teaching aids by 64.29% answered strongly agree. Based on the questionnaire, it shows that most students are interested in learning Picture and Picture integrated with Guided Note Taking accompanied by optimization of teaching aids.

This situation demonstrates that the pictures and teaching aids provided to the experimental group in the use of Picture and Picture learning can improve student learning outcomes. These findings are consistent with (Basel, 1995), which states that images can evoke mental images in learners, allowing them to remember terms or concepts, strengthen literalism, and think critically and creatively. According to Elia, Panhuizen, & Georgiou, (2010), the image as a whole has cognitive potential.

In the control group, which used lectures, discussions, and presentations, the different learning conditions and atmosphere were revealed. The control group's learning is more dominated by the teacher as an information center (teacher-centered), so students

are less active in seeking information from other sources in learning, all of which are centered on the teacher, as a result, many students are bored and do other activities during the learning process, such as whisper talking with their mate, sleepy, and inattentive. As a result of this situation, student learning outcomes are less than ideal.

The control group's learning was also less than optimal in terms of increasing students' courage to communicate the outcomes of their discussions. Nugroho & Hanik, (2016) states that learning that is not liked and is not fun makes students feel stressed and does not enjoy the learning that is followed, causing the learning outcomes obtained to decrease.

Picture and Picture learning integrated with Guided Note Taking accompanied by optimization of teaching aids is more enjoyable than learning in the control group using lecture, discussion and presentation methods.

Outcomes of Biology Learning in the Cognitive Domain

Cognitive learning outcomes are the level of students' understanding or mastery of the concepts that have been studied (Hadijah & Anggereni, 2016). This understanding is reflected in the results of the cognitive test which contains 25 multiple choice questions which are carried out after the learning takes place. The results of the hypothesis test show that the application of Picture and Picture learning is integrated with Guided Note Taking accompanied by the optimization of teaching aids has a positive effect on improving student biology learning outcomes in the cognitive domain. Data on students' cognitive learning outcomes on the material of the human reproductive system from the control class and the experimental class can be seen in Table 4.

Table 4. Descriptive analysis of cognitive learning outcomes

Description	Control Class	Experimental Class
∑	28	28
Mean	78.14	84.71
Median	80.00	84.00
Variance	59.83	41.55
Standard Deviation	7.74	6.45

The test results showed that the average score of the cognitive test of the experimental group students who applied Picture and Picture learning integrated with Guided Note Taking accompanied by the optimization of teaching aids in learning, was higher (84.71) than that of the control group students who applied conventional methods with lecture, discussion and presentation methods (74.18). Picture and Picture learning integrated with Guided Note Taking accompanied by optimization of teaching aids requires students to be active, with students building their own

knowledge (constructivism) making students more active in asking questions and expressing opinions.

Picture & Picture Learning, which emphasizes pictures as the most important aspect in the learning process, encourages students to be more engaged in their studies. This is in line with Elia, Panhuizen, & Georgiou, A, (2010), which claim that the image as a whole contains cognitive potential. Students benefit from the stage of gluing pieces of paper from incomplete images into complete images since it helps them recall and understand the subject matter. Susdarwono, (2021) adds to this remark by stating that biology is a science that prioritizes delivering a direct experience rather than memorizing facts, concepts, or hypotheses. Students' participation in obtaining their learning experiences has a significant impact on their learning results (Gino, Suwarni, Suripto, Maryanto, & Sutijan 1993).

The integration of Guided Note Taking is at the stage of building concepts by students, making students continue to concentrate on learning. This is in line with Samitra, Krisnawati, & Malasari (2018) which states that Guided Note Taking improves biology learning outcomes in the cognitive domain.

The traditional note-taking method is still used in the control group's learning. Images are used to provide material in its entirety, complete with descriptions so that students are less likely to construct their own learning concepts. This situation resulted in passive students and the teacher acting as a full-fledged information center, leading to students receiving less-than-optimal information and understanding. Giving complete handouts in the control group caused students to take notes as they pleased without any guided notes, resulting in students not understanding the material because most students were too lazy to read. This situation caused cognitive learning outcomes in the control group to be suboptimal. This is because learning with conventional methods will reduce students' learning attention. Less learning attention will result in long-term memory receiving only a little information so that learning outcomes tend to decrease (Wikara, Sutarno, Suranto, & Sajidan, 2020). In contrast to the experimental group that applies Guided Note Taking or guided notes in their learning, Silberman, (2009) states that students who are given guided notes can help students understand during learning.

Based on the discussion of learning outcomes in the cognitive domain that has been carried out, it can be clearly seen that Picture and Picture Learning integrated with Guided Note Taking accompanied by optimization of teaching aids has a positive influence on biology learning outcomes in the cognitive domain.

Outcomes of Biology Learning in the Affective Domain

Affective (attitude) is a product of the learning process in the classroom, and it is one of the learning outcomes that students must have. Attitude is a person's manner of thinking and behaving toward something or someone that is relatively persistent (Adi1 & Yulianto, 2019) The results of statistical analysis can be seen in Table 5.

Table 5. Descriptive analysis of affective learning outcomes

Description	Control Class	Experimental Class
Σ	28	28
Mean	78.57	81.57
Median	78.00	81.50
Variance	38.03	18.48
Standard Deviation	6.17	4.30

The test results showed that the average score of the affective test of the experimental group students who applied Picture and Picture learning integrated with Guided Note Taking accompanied by the optimization of teaching aids in learning, was higher (81.57) than that of the control group students who applied conventional methods with lecture, discussion and presentation methods (78.57). Picture and Picture learning is integrated with Guided Note Taking accompanied by optimization of teaching aids that affect the value of students' affective learning outcomes after participating in learning. These affective values are grouped into character and social skills. The values included in the character are discipline in participating in learning, responsibility in groups, being careful in completing Student Worksheets and handouts, and being honest in carrying out the post-test.

During learning, social skills such as willingness to work in groups, appreciating, and not criticizing the viewpoints of other friends if they express an opinion are anticipated to be imprinted. Biology is seen as the essence of science, emphasizing the importance of having a scientific mindset (Wenno, 2008). This mindset is predicted to be instilled in students after Picture and Picture learning is combined with Guided Note Taking and teaching aid optimization, both in biology sessions and in other topics.

Rahmani & Sagedhi, (2011) strengthens the statement that Guided Note Taking is able to improve students' affective learning outcomes and is able to improve the quality of learning. This study also proves that Picture and Picture learning research integrated with Guided Note Taking accompanied by optimization of teaching aids has an effect on learning outcomes in the affective domain where the experimental group has a higher average than the control group.

Based on this statement, it clearly shows that Picture and Picture learning integrated with Guided

Note Taking accompanied by optimization of teaching aids has a positive influence on biology learning outcomes in the affective domain.

Outcomes of Biology Learning in the Psychomotor Domain

Assessment of psychomotor learning outcomes obtained through observation sheets. The psychomotor domain includes reflex movements, basic movement skills, perceptual ability, harmony or accuracy, complex skills, and interpretive expressive movements. The results of the hypothesis test state that the application of Picture and Picture learning is integrated with Guided Note Taking accompanied by the optimization of teaching aids has a positive effect on improving biology learning outcomes in the psychomotor domain. The results of statistical analysis can be seen in Table 6.

Table 6. Descriptive analysis of psychomotor learning outcomes

Description	Control Class	Experimental Class
Σ	28	28
Mean	81.75	86.61
Median	81.00	85.00
Variance	25.08	26.03
Standard Deviation	5.01	5.10

The average value of biology learning outcomes in the psychomotor domain of experimental group students who applied Picture and Picture learning integrated with Guided Note Taking accompanied by optimization of teaching aids in learning showed higher results (86.61) than the control group who applied lecture, discussion and presentation methods (81.75).

This is due to the fact that the control group receives little treatment and the teacher focuses solely on developing psychomotor skills through discussion and presentation activities, resulting in a lack of direct learning experience and an inability to develop student skills optimally. Obtaining these scores can be presumed to be the result of integrating Picture and Picture learning with Guided Note Taking and optimizing teaching aids to train students' psychomotor skills and help them achieve higher scores.

Another indicator that makes learning outcomes in the experimental group that implement Picture and Picture learning integrated with Guided Note Taking accompanied by optimization of teaching aids is better than the control group that applies the lecture, discussion and question and answer method is the achievement of indicators of image observation skills and teaching aids. Students in the experimental group observed pictures and props, whereas the control group only observed pictures. Anderson, (1987) states that teaching aids will provide a very important stimulus for students to learn tasks related to

psychomotor skills. According to Elia, Panhuizen, & Georgiou, A. (2010), images have two functions: representation (information) and numerical content display. Because the experimental group is provided an incomplete picture, students will actively participate in solving learning issues in order to improve psychomotor learning outcomes.

The indicators for concluding the learning material carried out in the experimental group are worksheets and Guided Note Taking, while in the control group are worksheets and complete handouts. Students' notes in the experimental group were more guided and could improve student psychomotor learning outcomes. Makany, Kemp, & Dror, (2008) states that Guided Note Taking helps students understand lesson information. Students will be active to ask questions and express opinions to complete the blank points that have been provided in Guided Note Taking. This means that students who are given guided notes can capture information from the teacher and use it to study for the exam.

Based on all the discussion of learning outcomes in the psychomotor domain that has been carried out, it can be clearly seen that Picture and Picture learning integrated with Guided Note Taking accompanied by optimization of teaching aids has a positive influence on biology learning outcomes in the psychomotor domain.

Conclusion

Based on the analysis and discussion of the research findings, it can be concluded that the use of Picture and Picture Learning integrated with Guided Note Taking, as well as optimizing the use of teaching aids, has a significant effect on the biology learning outcomes of students in grade 11 in Natural Science, Public Senior High School 2 Boyolali in the cognitive, affective, and psychomotor domains.

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