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EFFORTS TO IMPROVE CRITICAL THINKING SKILLS AND INTEREST IN LEARNING MATHEMATICS USING THE INTEGRATED NUMBER HEAD-TOGETHER PROBLEM-BASED LEARNING MODEL

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Abstract
This study aims to improve students' critical thinking skills and interest in learning mathematics through the application of Problem-Based Learnin (PBL)-Numbered Head Together (NHT) learning. This research is a Classroom Action Research (PTK) which is carried out for two cycles. The subjects of this study were 26 grade VIII D students at SMP Negeri 1 Gumelar for the 2022/2023 school year. Data collection was carried out with three instruments, namely observation sheets, tests, and non-tests. The results showed that students' critical thinking skills and interest in learning mathematics increased. In the initial condition, students' critical thinking skills before learning were not completed then after learning in the 2nd cycle classical completeness was achieved with a percentage of 85.4% of students who were completed. Increased critical thinking skills are also in line with increased interest in learning mathematics. Students' interest in learning mathematics before learning had an average score of 51.19 with the medium category and in the 2nd cycle obtained a score of 63.31 with a high category in accordance with the research target. This is supported by the increase in the percentage of PBL-NHT learning implementation from cycle 1 by 83% to 92% in cycle 2 for both teacher and student activities.
Keywords: *Critical thinking skills, Interest in learning, Numbered Head Together, Problem-based learning*

INTRODUCTION

Education is a way to meet the demands of 21st century skills that include ciritical thinking and problem solving, communication and collaboration, and creativity and innovation (Pacificic Policy Research Center, 2010). Therefore, in accordance with the objectives of national education and in line with the demands of the times, improving the quality of education is an urgent need. One of the efforts to meet the demands of 21st century abilities is through mathematics. Mathematics is one of the compulsory subjects in education in Indonesia from elementary to upper secondary levels. Mathematics is a science that is useful for human life and fundamental to the development of modern technology, as well as advancing human thinking. In line with Muijs and Reynolds (2005) who said that knowledge and technology are inseparable from the role of mathematics. According to Van de Walle (2008) also affirmed that people who are able to understand mathematics will have many opportunities and choices for a more productive future. According to Wijaya (2012) that there are several positions and roles of mathematics, namely mathematics is a way of thinking and asking questions, it is related to how students make plans related to mathematics, organize thoughts, analyze data, and solve problems.

Based on the position and role of mathematics, it shows that mathematics is an important subject to learn because it is useful in everyday life and a liaison in learning other subjects and fields. However, Veloo *et al.* (2014) state that generally students think that mathematics is difficult to master. Because

of this, some students perform very well while some fail to master a topic even when they face easy topics.

One of the abilities developed in learning mathematics is the ability to think critically. The ability to think critically is one of the demands of 21st century abilities that must be possessed by students today. This was conveyed by the National Education Association (2014) stating that the abilities that are considered important and need to be possessed by a student of all types of abilities include critical thinking, communication, collaboration, and creativity.

According to Wolfok (2011), critical thinking ability is an ability to carry out reasoning in response to a situation based on evidence and other supporters to be able to provide conclusions in the end. Furthermore, Tittle (2011) states that critical thinking is an evaluation of opinions that have reasons, where the basis of critical thinking itself is not only in the form of emotions, intuition, or beliefs but thoughts that are carried out rationally. Based on this opinion that by thinking critically students will be guided to be able to draw the right conclusion accompanied by logical reasons.

The importance of critical thinking skills is not in line with conditions in the field. The results of pre-research conducted in class VIII D SMP Negeri 1 Gumelar showed that critical thinking skills in the class had not shown good results. This can be seen from the results of the *pretest* conducted in class VIII D SMP Negeri 1 Gumelar for Statistics material with an average of 30 and no students who reached Minimum Completeness Criteria.

Based on the results of learning observations made by teachers, this critical thinking ability still needs to be facilitated because teachers are accustomed to presenting learning with the lecture method. Students are not accustomed to making a conclusion from a concept discovery activity. The focus of learning carried out is only on material achievement and students can solve a problem or problem. Therefore, critical thinking skills in class VIII D SMP Negeri 1 Gumelar need to be facilitated.

In addition to students' cognitive abilities, affective abilities also need to be developed in mathematics learning. According to Veloo *et al* (2014) affective abilities are important to help students' cognitive abilities directly in improving mathematics learning outcomes. An important affective ability to develop is an interest in learning. According to Slameto (2010), interest in learning contributes greatly to student learning success. This is supported by the results of research that shows that there is an influence of interest in learning on students' mathematics learning achievement (Siagan, 2015). When students have a high interest in learning, they will really enjoy learning until in the end they show good learning results.

According to Slameto (2010) interest is a preference and a sense of attachment to a thing or activity without anyone telling it. This is in line with Sirait (2016) which defines interest in learning as the attention, liking, interest of students towards learning which is shown through enthusiasm, participation, and activeness in learning. According to Wibowo (2017), interest in learning mathematics means that students have the taste, effort, and willingness to learn mathematics. In Lee *et al.* (2014) research said

that interest in learning mathematics is a cognitive-affective construction that shows positive affective experiences and arousal attention to activities related to mathematics. Therefore, it can be concluded that the interest in learning mathematics is the liking and interest of students towards learning mathematics which is shown by active participation in learning activities.

Interest has an important role in supporting mathematics learning achievement. Students with a high interest in an activity will be shown by their enthusiasm in participating in the activity. In learning mathematics, a good interest in learning is needed for students. This is because interest serves as a strong driver, students who are interested in mathematics will be encouraged to do mathematical activities (Sukada *et al.*, 2013).

The importance of interest in learning mathematics is not in line with the reality in SMP Negeri 1 Gumelar. Interest in learning mathematics at SMP Negeri 1 Gumelar still needs to be improved. This can be seen when learning mathematics takes place some students are not focused. Students do other activities outside of learning such as playing alone, joking with friends, not doing assignments given by the teacher, and often permission to go to the bathroom during lessons. The results of these observations are in line with the pre-research conducted at SMP Negeri 1 Gumelar by distributing questionnaires of students' interest in learning mathematics in Class VIII D obtained data on the initial conditions of interest in learning mathematics are as follows.

Table 1. Initial Conditions of Interest in Learning Mathematics of Class VIII D Students

Criterion	Learning Interest
High	14.8%
Moderate	51.86%
Low	33.33%
Average	51.19 (Moderate)

Based on table 1, it is known that interest in learning mathematics class VIII D does not have a high level of interest in learning. This certainly needs to be a concern to do a learning that can increase student interest in learning.

The factor causing low interest in learning mathematics at SMP Negeri 1 Gumelar is that some students say that they do not like mathematics because mathematics is a subject that is considered difficult. The assumption that mathematics is difficult can be seen when student learning has prerequisite material that has not been mastered. For example, when observing learning on flat side space building material, students still find it difficult to do number calculations such as dividing large numbers, dividing decimal numbers, and material about the area or perimeter of flat buildings. This is possible because they experienced learning loss due to distance learning during the COVID-19 pandemic. According to the results of research Budi *et al.* (2021) One of the consequences *of learning loss is* the loss of interest in student learning which ultimately has an impact on suboptimal learning outcomes.

One of the learning models that can be used is problem-based learning. The problem-based learning approach is a progressive and student-centered active learning approach where unstructured problems (simulated complex problems or real-world problems) are used as the starting point and spearhead for the learning process (Tan, 2004). The practice of teaching with a problem-based learning approach changes the direction of teacher-centered learning interactions to learning that allows students to be actively involved in learning activities in the classroom.

According to Weissinger (2004) problem-based learning is an excellent environment to develop critical thinking skills. This is because problem-based learning begins with the presentation of unstructured problems so that it will stimulate students not only to understand at the level of memorization but must interpret the problem. This process will be able to train students to achieve the ability to understand a concept as well as think critically in order to solve contextual problems. This is in line with Barel (2010) which states that problem-based learning is one strategy that can prepare students to become inventors, problem solvers, critical thinkers and creatives in facing challenges or complex problems.

Learning with a problem-based learning approach combined with a cooperative learning model can enrich learning by facilitating students in developing critical thinking skills and interest in learning. According to Shimazone and Aldrich (2010), cooperative learning has several benefits, namely 1) cooperative learning encourages deep learning about the subject matter through a diversity of perspectives fostered by interactions between peers; 2) students who engage in cooperative learning achieve better grades than competitive or individual learning; 3) students learn valuable social skills and civic values in later life; 4) related to the first benefit, students learn higher-order skills i.e. critical thinking; 5) the personal growth that students achieve helps maintain psychological health and a positive attitude towards the learning experience; 6) Students develop a positive attitude towards independent learning.

One type of cooperative learning is numbered head together (NHT). According to Kagan and Kagan (2009), NHT learning is learning providing opportunities for students to convey ideas where each student has a number and all students in the team unite their thoughts for their best answer. NHT learning is thought to increase students' interest in learning because the process will provide opportunities to be actively involved in the discussion process, discovery activities, and presentations. This is in accordance with one of the factors of interest in learning conveyed by Darmadi (2017) the opportunity given by teachers to students to play an active role in the teaching and learning process.

Based on the theoretical review and the results of previous research described above, researchers assume that problem-based learning combined with NHT type cooperative learning is expected to increase students' critical thinking skills and interest in learning mathematics. Therefore, this study aims to improve students' critical thinking skills and interest in learning mathematics by using problem-based learning integrated with numbered head together.

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METHOD

This research is a classroom action research that aims to improve critical thinking skills and interest in learning mathematics in mathematics learning by applying PBL-NHT learning. The design in this study uses a design developed by Kemmis *et al.* (2014) which consists of four stages, namely planning, action, observation, and reflection. The four stages represent a cycle. This research was carried out as many as two cycles. Where in these two cycles have achieved the success indicators used in this study.

This research was carried out in one of the public junior high schools in Banyumas Regency to 26 grade VIII students. Data collection was carried out using three instruments, namely observation sheets, tests, and questionnaires. Observation sheets are used to collect data related to the implementation of PBL-NHT learning. Observation is carried out by researchers as observers through direct observation during the learning process. The test's administration is carried out to measure students' critical thinking skills at the time before the action and at the end of each cycle. Questionnaires are used to measure students' interest in learning mathematics both before the action to determine the initial condition and at the end of each cycle. All three instruments have been validated by experts. The success criteria in this class action research can be seen from the targets specified in Table 2. The target was determined after a pre-research study was conducted. The data analysis technique carried out in this study is qualitative descriptive data analysis and is supported by quantitative data analysis.

Table 2. Initial Conditions and Research Success Criteria

Variable	Criterion	Initial Conditions	Target
Interest in Learning Mathematics	High	14.8%	76.92%
	Moderate	51.86%	23.08%
	Low	33.33%	0%
	Average	Moderate (51.19)	High
Critical Thinking Skills	KKM achieved	0%	≥75%
	Average	30	68
Learning Process	Successful Learning	0%	≥ 85 %

RESULTS AND DISCUSSION

This class action research is carried out in 2 cycles and begins with pre-research by making classroom observations. The description of the results is as follows.

Description of Pre-Research

Pre-research activities are carried out through observation in class, giving pretests to see the initial condition of students' critical thinking skills and providing questionnaires of interest in learning mathematics to determine the initial conditions before action. Observation is done by observing the

ongoing learning process in the classroom. The results show that this critical thinking ability still needs to be facilitated because teachers are accustomed to presenting learning with the lecture method. Students are not accustomed to making a conclusion from a concept discovery activity. The focus of learning carried out is only on material achievement and students can solve a problem or problem.

In addition, in the results of observations regarding interest in learning mathematics, researchers concluded that interest in learning mathematics at SMP Negeri 1 Gumelar still needs to be improved. This can be seen when learning mathematics takes place some students are not focused. Students do other activities outside of learning such as playing alone, joking with friends, not doing assignments given by the teacher, and often permission to go to the bathroom during lessons. Even though this interest in learning will affect students in participating in learning activities and cooperation in developing the understanding obtained and mathematics learning outcomes. Therefore, the role of interest in learning cannot be ignored in learning mathematics in schools.

The results of giving pretests and questionnaires describing the initial condition of students are presented in table 3.

Table 3. Pre-Research Student Initial Condition Data

Variable	Criterion	Initial Conditions	TargetTarget
Interest in Learning Mathematics	High	14.8%	76.92%
	Moderate	51.86%	23.08%
	Low	33.33%	0%
	Average	Sedang (51.19)	Tinggi
Critical Thinking Skills	KKM achieved	0%	≥75%
	Average	30	68

The results of observations are in line with students' critical thinking skills in the initial condition, there is still nothing complete with an average gain of 30. As for the initial condition of students' interest in learning mathematics where the average is still in the medium category and there are still 33.33% of students categorized as low. From these results, efforts need to be made to improve critical thinking skills and interest in learning mathematics.

Cycle 1

Cycle 1 is carried out during two learning meetings in class. The implementation of cycle 1 actions begins with planning activities which include preparing lesson plans, LKPD, assessment instruments and observation sheets for learning implementation. RPP and LKPD are arranged following the problem-based learning (PBL) learning flow with numbered head together (NHT) settings in Statistics material. The instruments prepared include tests of critical thinking skills and questionnaires of interest in learning mathematics.

The implementation of learning on cycle 1 is two learning meetings and one meeting for posttest. The first meeting was held for 80 minutes on data analysis material and the second meeting was held for 80 minutes on calculating the average (mean) material of a data. The steps of learning PBL with NHT settings are 1) problem orientation (Questioning), 2) organizing students to learn (Numbering), 3) assisting independent and group investigations (Heads Together), 4) developing and presenting the results of discussions (Call Out), and 5) analyzing and evaluating the problem-solving process (Answering). The results of cycle 1 are described in Table 4.

Table 4. Achievement of Cycle 1 Actions

Variable	Criterion	Initial Conditions	Target	End of Cycle 1
Interest in Learning Mathematics	High	14.8%	76.92%	50 %
	Moderate	51.86%	23.08%	34.62%
	Low	33.33%	0%	15.38%
	Average	Moderate (51.19)	High	Moderate (54.65)
Critical Thinking Skills	KKM achieved	0%	≥75%	42.31%
	Average	30	68	55.4
Learning Process	Successful Learning	0%	≥ 85 %	83%

The achievement obtained from the actions in cycle 1 for the interest in learning mathematics can be said to have not met the target. However, there has been a change for the better. This can be seen for the low category in cycle 1 already 0%. Thus, the provision of PBL learning treatment with NHT settings has a better effect. In line with the conservation record where students begin to be enthusiastic about the activities in learning and try to understand the results of the discussion to later be able to move forward when the number is chosen. In the achievement of critical thinking skills, 42.31% of students have reached KKM with an average of 55.4, meaning that they have not met KKM. However, for the learning process only reached 83% of the desired target of 85%. Therefore, to meet the overall target, cycle 2 is carried out.

Based on the results of the actions in cycle 1, several notes were obtained as a reflection for the next action, namely first, students were still not used to using LKPD so that during learning many students asked the stages of the work. Therefore, teachers need to provide direction and explanation about the procedures for working on LKPD and the preparation of LKPD is also improved in terms of the use of words, flow and appearance of LKPD so that it is easy to understand. Second, many students are still passive both during group discussions and classics so teachers need to provoke and motivate students to be active both in asking questions and solving ideas so that active discussions will be created that put students at the center of learning. Third, the process of hetergogenic grouping of students has the disadvantage that it takes a long time for students to move to sitting positions so that in cycle 2 the teacher forms a simpler group.

Cycle 2

Cycle 2 actions are carried out based on the results of reflection from cycle 1 in order to meet the targets that have been set on interest in learning mathematics, critical thinking skills and learning implementation. This cycle 2 activity begins with learning planning based on improvement points in cycle 1. Cycle 2 is carried out for two learning meetings and one meeting for posttest. The first meeting was held for 80 minutes on the material determining the median and mode of a data and the second meeting was held for 80 minutes on the material determining the size of data distribution. The achievement in cycle 2 is explained in Table 5.

Table 5. Achievement of Cycle 2 Actions

Variable	Criterion	Initial Conditions	Target	End of Cycle 1	End of Cycle 2
Interest in Learning Mathematics	High	14.8%	76.92%	50 %	80.77%
	Moderate	51.86%	23.08%	34.62%	19.23%
	Low	33.33%	0%	15.38%	0%
	Average	Moderate (51.19)	High	Moderate (54.65)	High (63.31)
Critical Thinking Skills	KKM achieved	0%	≥75%	42.31%	92.23%
	Average	30	68	55.4	85.4
Learning Process	Successful Learning	0%	≥ 85 %	83%	92%

The achievement in cycle 2 as a whole is seen from the interest in learning mathematics, critical thinking skills and the learning process has met the target. Interest in learning and critical thinking skills have increased from cycle 1. In cycle 2, students have responded positively to the application of PBL learning with NHT settings. This can be seen in the discussion process that is much better and looks enthusiastic in working on LKPD. Students actively ask questions and also actively respond to other students when presenting. In addition, students' understanding of statistical material is getting better. This can be seen when students do exercises on critical thinking skills can solve it well. Therefore, it can be said that the application of PBL learning with NHT settings has a positive impact.

PBL-NHT learning in this study has increased students' critical thinking skills and interest in learning mathematics. These results are in accordance with previous research showing that problem-based learning is effective for improving critical thinking skills (Rahmah *et al.*, 2019; Widyaningtyas *et al.*, 2015). In addition, these results are in line with the research of Astutik (2017) and Mashuri *et al.* (2019) which states that problem-based learning is effective in terms of the interests of junior high school students. The research of Saragih (2022) and Arifin (2020) also supports the results of this study where the results of the two studies state that numbered head together (NHT) learning can increase students' interest in learning mathematics. In general, the results of this study are presented in figure 1.

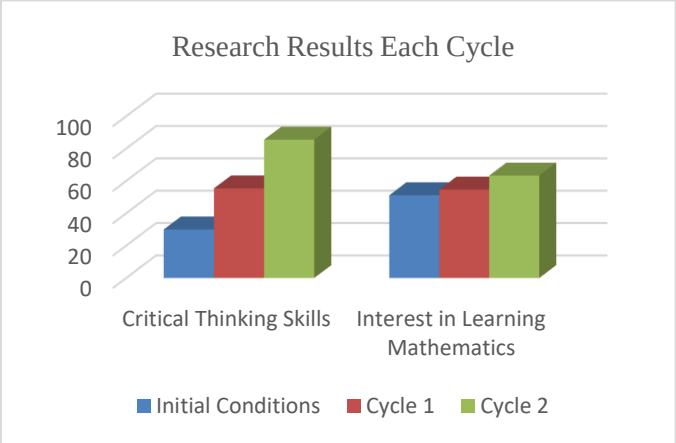

Figure 1. Obtaining scores on Critical Thinking Skills and Interest in Learning Mathematics

There are several things that are thought to cause students' critical thinking skills to increase in the application of PBL-NHT learning. First, in PBL-NHT learning students are given the task of solving complex problems related to the real world. To reach the right solution, students need to analyze, strategize, and consider various possible approaches. This process encourages students to think critically in identifying problems, gathering relevant information, and evaluating various possible solutions. This is in line with the opinion of Barel (2010) which states that *problem-based learning* is one strategy that can prepare students to become inventors, problem solvers, critical thinkers and creatives in facing challenges or complex problems.

Second, PBL-NHT learning students will be involved in the discussion process and collaborate with their group members. They share ideas, give opinions, and debate concepts or solutions proposed. These discussions and collaborations encourage students to think critically because they must consider multiple points of view, defend their arguments, and seek the most rational and effective solutions. In addition, Talib *et al.* (2014) also stated that PBL learning with a combination of cooperative learning does not expect students to only hear, record and remember concepts but they must actively think, communicate with friends and use the potentials they already have so that they can build more meaningful knowledge both individually and in groups which will later have an impact on students' critical thinking skills.

Third, in the PBL-NHT learning process, there are student activities for the presentation of discussion results. In this activity, students are invited to evaluate and analyze the resulting solution. The process will ask students to weigh the advantages and disadvantages of each solution and compare the group's own solution with other groups. This process of evaluation and analysis requires critical thinking skills, such as the ability to identify unproven assumptions, assess the validity of arguments, and make conclusions based on evidence and logic.

In addition to critical thinking skills, PBL-NHT learning in this study has also increased students' interest in learning mathematics. There are several suspected causes, namely first, in PBL-

NHT learning is associated with students' daily life situations. Thus, students will see the importance of mathematics in a more real and relevant context, thus increasing their interest in learning. This is in line with Darmadi (2017) which states that one of the factors that influence interest is that lessons will attract students if there is a relationship between lessons and real life. In Djidu and Retnawati (2018) research also states that the dean's contexts with students' daily lives are one of the main keys that can increase students' interest and interest in learning mathematics.

Second, PBL-NHT learning provides opportunities for students to be active in discovering concepts collaboratively. This is in accordance with one of the factors of interest in learning conveyed by Darmadi (2017), namely the opportunity given by teachers to students to play an active role in the teaching and learning process. The process will actively involve students in discussions and interactions with group mates. They are invited to think, formulate answers, and participate directly in learning. This creates a more engaging, interactive, and enjoyable learning experience for students. In addition, it is supported by Sholikhah and Hartono (2015) who stated that problem-based learning is not only about providing problems in learning but also about creating opportunities for students to build knowledge through collaborative interaction and inquiry.

Third, PBL-NHT learning trains students to be responsible and actively participate in every activity given. Each group member has a different sequence number, which means each student has the responsibility to contribute to group discussions. This encourages students to actively participate and share their thoughts. By feeling responsible for their group, students become more motivated to be actively involved in learning and increase their interest in understanding the material.

Fourth, in PBL-NHT learning, each group member has the opportunity to participate and provide answers. When students give correct answers, they gain recognition and appreciation from their group, other groups, and teachers. This creates a positive atmosphere that encourages students to dare to speak up and contribute. This positive reinforcement can increase interest in learning because students feel valued and get recognition for their efforts and contributions. This is in accordance with Amir & Risnawati's (2015) research where positive reinforcement in the form of awards given by teachers will affect students' interest in learning.

CONCLUSION

Based on the results of the research and discussion that has been described, it can be concluded that students' critical thinking skills and interest in learning have increased after applying PBL-NHT learning in two cycles. The score of critical thinking skills has improved from the initial condition with the acquisition of no students who achieved KKM until at the end of the second cycle has met the target of more than 75% of students achieving KKM. The interest in learning mathematics also experienced the same thing where in the initial condition it was still in the medium category then increased until the end of the second cycle in the high category. The results of this study can show that PBL-NHT learning

can be an alternative to classroom learning to improve students' critical thinking skills and interest in learning mathematics. In addition, suggestions for future research can be studied in more depth for other cognitive and affective aspects.

REFERENCES

Arifin, M. (2020). Strategi pembelajaran numbered head together (NHT) dalam meningkatkan minat belajar siswa pada materi stastistika. *Jurnal Didactical Mathematics, 2(2), 10-20.* https://doi.org/10.31949/dmj.v2i2.2074

Astutik, H. S. (2017). Kefektifan pembelajaran masalah pada bangun ruang sisi datar ditinjau dari penguasaan SK, motivasi, dan minat siswa SMP. *Jurnal Riset Pendidikan Matematika*, 4(1), 56-66. https://doi.org/10.21831/jrpm.v4i1.12722

Barel, J. (2010). Excerpts from "*Problem-Based Learning: The Foundation for 21st Century Skills*",

Budi, Setia., Utami, Iga Setia., Jannah, Rehan Nil., Wulandari, Nurul Lathifa., Ani, Nova Andri., & Saputri, Wulandari. (2021). Potensi learning loss pada siswa berkebutuhan khusus selama pembelajaran daring masa pandemic covid-19 di sekolah inklusif. *Jurnal Basicedu,* 5(5), 3607-3613. https://doi.org/10.31004/basicedu.v5i5.1342

Darmadi. (2017). *Pengembangan Model dan Metode Pembelajaran dalam Dinamika Belajar Siswa.* Yogyakarta: Deepublish.

Djidu, H., & Retnawati, H. (2018). Cultural values-integrated mathematical learning model to develop HOTS and character values. In E. Retnowati, A. Ghuforn, Marzuki, Kasiyan, A.C. Pierawan, & Ashadi (Eds), *Character education for 21st century global citizen (pp. 363-370).*

Kagan, S. & Kagan, M. (2009). *Kagan Cooperative Learning.* CA: Kagan Publishing.

Kemmis, S., McTaggart, R., & Nixon, R. (2014). *The action research planner doing criical participatory action research.* New York: Springer.

Lee, W., Lee, M., dan Bong, M. (2014). Testing interest and self-efficacy as predictors of academic self-regulation and achievement. *Contemporary Education Psychology,* 39(2), 89-99. https://doi.org/10.1016/j.cedpsych.2014.02.002

Mashuri, Sufri., Djidu, Hasan., & Ningrum, Retno Kusuma. (2019). Problem-based learning dalam pembelajaran matematika: Upaya guru untuk meningkatkan minat dan prestari belajar siswa. *PYTHAGORAS: Jurnal Pendidikan Matematika, 14(2), 112-125.* https://doi.org/10.21831/pg.v14i2.25034

Muijs, D. & Reynolds, D. (2015). *Effective teaching evidence and practice.* London: SAGE Publications.

National Education Association. (2014). *Preparing 21 st century students for a global society: an educator's guide to the "Four Cs."* Washington D.C.: National Education Association.

Pacific Policy Research Center. (2010). *21st century skills for student and teacher*. Honohulu: Kamehameda School, Research & Evaluation Division

Rahmah, L. A., Soedjoko, Edy., & Suneki. (2019). Model pembelajaran PBL meningkatkan kemampuan berpikir kritis matematis dan rasa ingin tahu siswa kelas X SMAN 7 Semarang., *PRISMA, Prosiding Seminar Nasional Matematika 2, 807-812*

Saragih, Rasmawati. (2022). Penggunaan strategi pembelajaran numbered head together (NHT) dalam meningkatkan minat belajar siswa pada maple matematika sub materi garis dan sudut di kelas VII A SMP Negeri 2 Arut Selatan tahun ajaran 2019/2020. *Anterior Jurnal, (22) 1, 36-41.* https://doi.org/10.33084/anterior.v22iSpecial-1.3235

Shimazoe, J., & Aldrich, H. (2010). Group work can be gratifying: Understanding & overcoming resistance to cooperative learning. *College Teaching,* 58(2), 52-57. https://doi.org/10.1080/87567550903418594

Sholikhah, M. & Hartono. (2015). Perbandingan keefektifan antara problem-based learning setting numbered head together dan setting jigsaw. *Jurnal Riset Pendidikan Matematika,* 2(1), 63-77. https://doi.org/10.21831/jrpm.v2i1.7151

Siagan, R.E.F. (2015). Pengaruh minat dan kebiasaan belajar siswa terhadap prestasi belajar matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA,* 2(2), 122-131. https://doi.org/10.30998/formatif.v2i2.93

Sirait, E.D. (2016). Pengaruh minat belajar terhadap prestasi belajar matematika. *Formatif: Jurnal Ilmiah Pendidikan MIPA,* 6(1), 35-43. https://doi.org/10.30998/formatif.v6i1.750

Slameto. (2010). *Belajar dan faktor-faktor yang mempengaruhinya*. Jakarta: Rineka Cipta.

Sukada dkk. (2013). Kontribusi Minat Belajar, Motivasi Berprestasi dan Kecerdasan Logis Matematika terhadap Hasil Belajar Matematika Siswa SMA Negeri 1 Kintamani. *e-Journal Program Pascasarjana Universitas Pendidikan Ganesha,* (4).

Talib, Ahmad., & Bin Kailani, Ismail. (2014). Problem based learning and its impact on development of personal intelligence. *International Journal of Evaluation and Research in Education* (IJERE), 3(4), 236-244. https://doi.org/10.11591/ijere.v3i4.6969

Tan, O. S. (2004). *Enhacing thinking through problem-based learning approaches: International prespectives.* Singapore: Cengage Learning.

Tittle, P. (2011). *Critical thinking: An appeal to reason*. New York: Routledge.

Van De Walle, J. A. 2008. *Matematika Sekolah Dasar Dan Menengah - Pengembangan Pengajaran*. Jakarta: Erlangga.

Veloo, A., Ali, R. M., & Krishnasamy, H. N. (2014). Affective determinants of additional mathematics achievement in Malaysian technical secondary schools. *Procedia - Social and Behavioral Sciences,* 112, 613–620. https://doi.org/10.1016/j.sbspro.2014.01.1208

Weissinger, P. A. (2004). Critical Thinking, Metacognition, and Problem Based Learning. *Enhancing Thinking through Problem Based Learning Approach: International Perspectives*.

Wibowo, A. (2017). Pengaruh pendekatan matematika realistic dan saintifik terhadap prestasi belajar, kemampuan penalaran matematis, dan minat belajar. *Jurnal Riset: Pendidikan Matematika,* 4(1), 1-10. https://doi.org/10.21831/jrpm.v4i1.10066

Widyaningtyas, R., Kusumah, Yaya.S., Sumarmo, Utari., & Sabandar. (2015). The impact of problem-based learning approach for senior high school student's mathematics critical thinking ability. *Journal on Mathematics Education, 6(2), 107-116.* https://doi.org/10.22342/jme.6.2.2165.107-116

Wijaya, A. (2012). Pendidikan matematika realistik: Suatu alternatif pendekatan pembelajaran matematika. Yogyakarta: Graha Ilmu.

Wolfolk, A. (2011). *Educational Psychology 13th ed*. Boston. Pearson.