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# The Influence of the Problem Based Learning Model and Self Efficacy on the Creative Thinking Ability of Class XI MIPA Students

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**Abstract:** This research is true experimental research with a 2x2 factorial design. The research sample consisted of two classes, namely class XI MIPA 1 and class Physics students are taught using a Problem Based Learning model with a discovery model for students who have low self-efficacy and to show whether there is an interaction between the learning model and self-efficacy on students' creative thinking abilities. The average score for creative thinking abilities of students taught using the Problem Based Learning and discovery learning model is 34.50 and 24.13. Hypothesis testing uses two-way ANOVA. The results of hypothesis testing concluded that overall, there is a significant difference in creative thinking ability between students who are taught using the Problem Based learning model and those taught using the discovery learning model. For students who have high self-efficacy there is a difference in creative thinking ability between students who taught using a Problem Based learning model with discovery, and there is no interaction between the learning model and self-efficacy on students' achievement of creative thinking abilities.

**Keywords:** Creative Thinking Ability; Problem Based Learning; Self-Efficacy

## Introduction

The development of the 21st century in the fields of science and technology has brought quite rapid changes to society in the development sector, one of which is in the field of education. The role of education has the benefit of preparing superior future generations who can think critically, think creatively in solving problems and are able to develop ideas. In the 21st century, this involves aspects of skills and understanding, but also emphasizes aspects of creativity, collaboration and speaking skills (Horsan, 2014; Juniarso, 2020; Ishak et al., 2017). According to Woolfolk (Armandita et al., 2017), extensive knowledge is the basis for creativity. The wider the knowledge, the greater the possibility of generating new ideas, so that it can influence a person's original thinking ability.

One of the high-level thinking abilities that can be used to solve a problem is the ability to think creatively (Kemendikbud, 2013). Creative thinking is a person's ability to create new ideas and implement them to solve problems. The characteristics of creative thinking include fluency, flexibility and originality of thinking (Firdausi & Asikin, 2018). The results of the observations found that: there is still minimal understanding of how to analyze questions, so that when given a test in essay form there are still many students who remedial or repeat this. This proves that the creative thinking ability of physics is still low, the creative thinking ability of students is still low, where There are only a number of students who can develop their abilities or thinking skills in working on physics questions but this is still said to exist but is rare. One example is that most students cannot answer more than one answer, likewise in the problem-solving process, the problem-solving process is still focused on what has been explained by the teacher.

The learning model applied is still monotonous, students are still less active in learning and only memorize material or formulas without understanding them and students are able to solve physics problems, if they only apply the formula and according to existing examples of problems but when faced with different problems or

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changes then students experience difficulty in completing it. According to Ridwan et al. (2021) stated that problem based learning is learning that uses real world problems as a context for students to learn about creative thinking and problem solving skills, as well as to obtain knowledge and concepts that are essential to the subject. what was studied. Azmi et. al. (2016) says that in the problem-based learning model, learning focuses on selected real problems so that students not only learn concepts related to the problem but also scientific methods for solving these problems. Applying this problem-based learning model, students can develop their critical thinking skills by compiling their own knowledge. Students can also use the initial knowledge they have to search for new information related to the problems presented during the learning process, so that the Problem-Solving process can be easier and more precise.

In line with research conducted by Susi et al. (2021) which states that critical thinking skills taught using Problem Based learning are higher than discovery learning, this can prove that Problem Based learning can improve a person's thinking ability, both thinking ability critical and creative thinking abilities (Astika et al., 2013; Zulkarnaen et al., 2022). The reality is that creative thinking skills in Indonesia are still relatively low. This is shown based on the research findings of Richard Florida et al. in the 2015 Global Creativity Index which stated that Indonesia was ranked 67th out of 139 countries. Based on the results of this research, it shows that there is something wrong in the education process in Indonesia. Indonesian creativity does not have the space to give birth to creative ideas both in schools and in the social environment. It turns out that creativity education is still minimally taught to students (Yuliatin et al., 2021).

Students' low creative thinking abilities are influenced by several factors, namely external and internal factors. External factors are factors that originate from outside the student or come from the environment, both social and non-social environments, while internal factors are factors that originate from within the student himself. One of the internal factors that can influence students' creative thinking abilities is self-efficacy. Someone who has strong self-efficacy will improve their self-achievement and well-being in various strategies, so that students who have high self-efficacy tend to have high thinking abilities as well (Oktalia & Sapri, 2017; Basith et al., 2020; Zarvianti & Sahida, 2020; Simanjuntak et al., 2021).

In general, self-efficacy is a person's assessment of their own ability to carry out certain behaviors or achieve certain goals (Omrod, 2009). From the definitions above, it can be concluded that self-efficacy is the belief a person has in their ability to control themselves in carrying out an activity so that the activity meets expectations and someone who has self-confidence tends to have confidence in their ability to achieve success. The indicators of self-efficacy are the level of difficulty of the task, the behavior or attitude shown in facing the task, the strength and weakness of beliefs, the individual's expectations of his abilities, considering experience as not an obstacle and using experience as a basis for increasing confidence. According to Kaharuddin et al.,(2020) there are many types of factors that influence learning, but can be classified into only two groups, namely internal factors and external factors. Internal factors are factors that exist within the individual who is learning, such as intelligence, attention, interest, talent, motivation, maturity and readiness (self-efficacy). In this scientific work the focus is on readiness (self-efficacy).

## Method

This type of research is True Experiment research (real experiment). This research was conducted to analyze the influence of a treatment on the characteristics of the subjects studied, in this case the influence of the Problem Based Learning model and self-efficacy on students' creative thinking abilities. The research design used is a factorial design because it uses the independent variable of the learning model and moderator variables (Emsir, 2017). The moderator variable is divided into 2 (two) groups, namely students who have self-efficacy (high and low). The research design can be seen in table 1.

**Table 1.** 2x2 ANOVA Design

| | | Learning Model (A) |
|---|---|---|
| Self-Efficacy (B) | PBL ($A_1$) | DL ($A_2$) |
| Tall ($B_1$) | $Y[A_1B_1]$ | $Y[A_2B_1]$ |
| Low ($B_2$) | $Y[A_1B_2]$ | $Y[A_2B_2]$ |
| Total | $Y[A_1B_1]+Y[A_1B_2]$ | $Y[A_2B_1]+Y[A_2B_2]$ |

Emzir (2017)

Information:

| | | |
|---|---|---|
| Y | : | Creative thinking ability |
| $A_1$ | : | Model Problem based learning |
| $A_2$ | : | Model discovery learning |
| B | : | Self-efficacy |
| $A_1B_1$ | : | Creative thinking abilities of students using a Problem Based Learning model who have high self-efficacy |
| $A_1B_2$ | : | The creative thinking ability of students using the Problem Based Learning model who have low self-efficacy. |
| $A_2B_1$ | : | The creative thinking ability of students who carry out discovery learning who have high self-efficacy. |
| $A_2B_2$ | : | The creative thinking abilities of students who carry out discovery learning have low self-efficacy. |

The instruments used are test instruments in the form of essays to test creative thinking skills and self-efficacy questionnaires which have been tested for validation and reliability through content validation using expert tests and empirical validity by testing validity, reliability, level of difficulty and distinguishing power. Data on the results of creative thinking abilities in this research were taken using an objective test instrument in the form of an essay test which was arranged based on indicators. Instruments were distributed to the research sample after 8 meetings. This research was carried out in 3 stages.

*The first stage*

This stage is a preparatory stage which includes first observations at the research location, namely SMA Negeri 11 Takalar which is located at Komara Village, Kec. Polebangkeng seletan Takalar Regency to obtain initial data and research samples. Some of the preparations made before conducting research are as follows: creating learning tools that are appropriate to the learning topic. The learning topics in this research are mechanical waves, traveling waves and stationary waves, namely: RPP (Learning Implementation Plan) making RPP aims to plan and prepare learning in class by implementing a problem based learning model, student worksheets (LKPD) are a reference that will used by students to solve problems during the learning process, the teaching materials used by researchers during this research are in accordance with the core competencies and basic competencies that apply in the school. Develop a research instrument in the form of a self-efficacy questionnaire consisting of three indicators. Develop a creative thinking ability instrument in the form of an essay consisting of 15 question items based on four indicators.

*Second Stage*

Before the instrument is applied in learning, expert validation, empirical validity testing, reliability testing, differential power testing and difficulty level testing are first carried out on the instrument to be used. The empirical test was carried out on classes that were not included in the sample, because there were only two classes in the study, the empirical test was carried out at SMA 8 Takalar with 49 respondents. Then, validity and reliability tests, discrimination and difficulty tests are carried out based on the data that has been obtained. This research was carried out by providing self-efficacy questionnaire sheets that had been prepared and validated before being given treatment to the two classes that had been selected as research samples. Providing this questionnaire sheet is used as a prerequisite in determining the sample size, which will later divide each class into two groups, namely students with high self-efficacy and students with low self-efficacy. Next, the learning process was carried out by applying the problem-based learning model in class XI MIPA 1 and the discovery learning model in class XI MIPA 2.

*Third phase*

The third stage of this research consisted of administering creative thinking ability tests to classes taught using the Problem Based Learning model and those taught using the discovery learning model. The test was not carried out simultaneously because it followed the physics subject schedule in class.

*Data collection technique*

*Instrument Validity*

The results of the analysis between three experts were analyzed using equation 1 (Retnawati, 2016).

$$V = \frac{\sum s}{n(c-1)} \quad (1)$$

Information:

| | | |
|---|---|---|
| V | : | Index of rater agreement regarding item validity |
| S | : | The score determined by each rater is minus the lowest score in the category used (s = r – lo, where r = score in the rater's chosen category and lo is the lowest score in the scoring category). |
| N | : | Number of raters. |
| C | : | The number of categories that raters can choose from |

*Validity test*

Using item validity, the data obtained is processed using the product moment correlation equation (Supardi, 2017) in Equation 2.

$$r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[N \sum X^2 - (\sum X)^2][n \sum Y^2 - (\sum Y)^2]}} \quad (2)$$

Information:

| | | |
|---|---|---|
| $r_{xy}$ | : | The "r" product moment correlation index number |
| N | : | Sample size |
| ∑XY | : | The sum of the multiplication results between the item score (X) and the total score (Y) |
| ∑X | : | Item score |
| ∑Y | : | Total score |

*Reliability Test of Creative Thinking Ability and Self-Efficacy*

The Cronbach's alpha technique (Supardi, 2017) can be used to determine whether a research instrument is reliable or not, if the answer given by the respondent is on a scale of 1 - 5 or the respondent's answer is interpreting an assessment. The formula for determining instrument reliability uses equation 3.

$$r_{ii} = \left(\frac{k}{k-1}\right)\left(1 - \frac{\sum \sigma_b^2}{\sigma_t^2}\right) \quad (3)$$

Information:
$r_{ii}$ : Instrument reliability coefficient.
k : Number of statement items.
$\sum \sigma_b^2$ : Total item variance.
$\sigma_t^2$ : Total variance.

*Difficulty Level*

The level of difficulty of a question item is expressed as a difficulty index. These numbers are real numbers in the interval 0 - 1. The greater the difficulty index, the easier the problem is. A question with a difficulty index of p = 1.00 means that all students answered the question item correctly, whereas if the difficulty index is p = 0.00, it means that no students answered the question item correctly. The difficulty index p is determined by equation 4.

$$p = \frac{p_h + p_l}{2} \quad (4)$$

Information:
P : Difficulty
Ph : Proportion of upper group students who answered correct test item
Pl : Proportion of lower group students who answered the test item incorrectly

**Table 2.** Difficulty Index Criteria

| Difficulty Index | Category |
|---|---|
| 0.00 - 0.30 | Difficult |
| 0.31 - 0.70 | Medium |
| 0.71 - 1.00 | Easy |

(Supardi, 2017)

*Differentiating Power*

The differentiating power of a question item states how far the ability of the item is to differentiate a group of smart students from a group of weak students, calculated by equation 5 (Supardi, 2017).

$$D = \frac{NH - NL}{NT} \quad (5)$$

Information:
D : Differentiating power
NH : Total score of upper group students.
NL : Total score of lower group students
NT : Maximum total score

**Table 3.** Differentiating Power Index Criteria

| Discriminating Power Index | Category |
|---|---|
| 0.00-0.30 | Bad |
| 0.31-0.40 | Enough |
| 0.41-0.70 | Good |
| 0.71-100 | Very well |

(Supardi, 2017)

## Result and Discussion

Before testing the hypothesis, the prerequisites are first tested using the normality test and homogeneity test. The Table 4 is the prerequisite test results. Based on Table 4 above, it can be shown that the significant value obtained is 0.269, indicating that the significant value is > 0.05, so it can be concluded that the creative thinking ability score data in class XI MIPA 1 is normally distributed. For a significant value of 0.114 > 0.05, it can be concluded that the creative thinking ability score data in class XI MIPA 2 is normally distributed. Based on the homogeneity test carried out, data was obtained as in Table 5. Based on the Levene Statistics test in Table 5, a significance value of 0.581 was obtained. This significance value is greater than 0.05, so it can be concluded that the data on the creative thinking abilities of class XI MIPA students comes from a homogeneous population.

Overall, the creative thinking ability of students who are taught using the Problem Based Learning model is higher than that of students who are taught using the discovery learning model. Students' creative thinking abilities for classes taught using the problem based learning model show that the material on mechanical waves, traveling waves and stationary waves has increased compared to classes taught using the discovery learning model, where the average score of students using the problem based model learning shows a final test score of $\bar{x}$ = 34.50 and the class taught using the discovery learning model shows $\bar{x}$ = 24.13 Testing the first hypothesis based on ANOVA analysis Table 6 shows Fcount = 23.59 and Ftable = 4.35 (Fcount ≥ Ftable) so it can be concluded that H0 is rejected or in other words H1 is accepted.

This means that overall, there are differences in creative thinking abilities between students who are taught using the Problem Based Learning model and the discovery learning model in class XI MIPA students. Students who are taught using the Problem Based learning model score higher creative thinking abilities compared to students who are taught using the discovery learning model. According to Sari et al. (2022), Discovery Learning is the process of finding information that students do not yet know. In the discovery learning learning model, students play an active role in the learning process by carrying out activities such as

answering several questions and solving problems to discover basic concepts. However, during implementation, students were still less active in the discovery process of the problems given.

**Table 4.** Data Normality Test

| Class | Statistics | Df | Shapiro-Wilk Significance |
|---|---|---|---|
| XI MIPA 1 | 0.944 | 22 | 0.27 |
| XI MPIA 2 | 0.90 | 22 | 0.11 |

**Table 5.** Homogeneity Test of Class XI MIPA Data

| | Statistic Levene | df1 | df2 | Sig. |
|---|---|---|---|---|
| Average | 0.30 | 1 | 42 | 0.581 |
| Median | 0.35 | 1 | 42 | 0.558 |
| Median and Df | 0.35 | 1 | 38.01 | 0.558 |
| Average | 0.29 | 1 | 42 | 0.597 |

**Table 6.** Summary of 2x2 Anova results

| Sources of Variance | df | $F_{count}$ | $F_{table}$ | Sig. |
|---|---|---|---|---|
| Model | 1 | 23.59 | 4.35 | 0.01 |
| Moderator | 1 | 14.623 | 4.35 | 0.01 |
| Model*Moderator | 1 | 0.742 | 4.35 | 0.399 |

Research conducted by Setiono, Sarwanto and Suparni (2012) states that in problem-based learning, students are required to solve the problems presented by digging up as much information as possible, then analyzing it and looking for solutions to existing problems. The solution to this problem does not absolutely have one correct answer, meaning that students are also required to learn creatively. learning with the Problem Based Learning model assisted by multimedia has a significant effect on student learning outcomes (Hadriwani, Jamaluddin, Karnan & Yamin, 2022). According to Ersoy et al. (2010), some students take responsibility for learning by implementing PBL. Students also become independent individuals who continue to learn throughout their life. Siswono (2006) said that creative thinking is a process used when generating a new idea. It combines ideas that have not been done before. In general, creative thinking is triggered by challenging problems. The ability to think creatively in problem solving standards by NCTM (2000), including applying and adapting various strategies in solving problems. Creative thinking skills are not developed enough at school, so students are only able to remember what they learn and do not know how that knowledge is applied. This can also be seen in everyday life, where students become consumptive and do not know how to create (Arisanti et al., 2017).

The significant difference between students who take part in learning using the Problem Based Learning model and students who are taught using the discovery learning model is due to differences in treatment of the learning steps. The Problem based learning model provides its own challenges to students to discover new knowledge. The application of this learning model also helps and encourages students to transfer their knowledge to understand problems in real life and develops students' ability to think creatively compared to the discovery learning model. Learning with the discovery learning model, when students are given lessons, they wait more for information from the teacher than looking for information themselves, and students are more likely to discuss things outside the lesson material if students are not supervised. For students who have high self-efficacy, there is a difference between the creative thinking abilities of students who are taught using the Problem Based Learning model and the discovery learning model in class XI MIPA students.

Hypothesis 2 cannot be resolved by only testing F, because Table 6 produces an analysis of variance between self-efficacy groups as a whole, namely the value of Fcount = 14.623 > Ftable = 4.35 which can be concluded that self-efficacy influences creative thinking abilities, so the Tukey test was carried out. to see differences in students' high self-efficacy. Testing the second hypothesis based on high self-efficacy, the value obtained is Q calculated > Q table, namely 8.07 > 4.20, so it can be concluded that H0 is rejected. This answers the second hypothesis, for high self-efficacy there are differences in the creative thinking abilities of students who are taught using Problem Based Learning models and discovery learning models. Differences in the self-efficacy of students who are taught using the problem-based learning model and the discovery learning model can also be seen from the initial state of the students in starting the learning process which includes a person's assessment of their ability to carry out certain behaviors in achieving certain goals. Self-efficacy gives students confidence in their ability to carry out a given task so that it trains students to grow their self-confidence that they are able to carry out a task or mandate given by the teacher. A belief that arises within the individual is very necessary for students to be able to push their abilities to a higher level, one of which is the level of thinking.

According to Ghufron and Risnawati (2012), there are psychological aspects that contribute to a person's success in completing tasks well. This psychological aspect is self-efficacy. According to Bandura, efficacy will increase student success in two ways, namely first, efficacy will foster interest from within in activities that are considered interesting. Second, someone will organize themselves to achieve goals and be strongly committed. Children who believe that intelligence cannot be changed will not do much to change it. A person needs to formulate a goal or target for themselves, to what extent

the individual strives for that target, then how strong the person is able to overcome problems that arise, and how strong the person is able to face failure. High self-efficacy will determine a person's success in carrying out their duties.

For students who have low self-efficacy, there are differences in the creative thinking abilities of students who are taught using the problem-based learning model and students who are taught using the discovery learning model. Hypothesis 3 cannot be resolved by just testing F, because Table 6 produces an analysis of variance between the self-efficacy groups as a whole, namely the value of Fcount = 14.623 > Ftable = 4.35 which can be concluded that self-efficacy influences creative thinking abilities, so the Tukey test was carried out. to see the difference in students' low self-efficacy. Testing the second hypothesis based on high self-efficacy, the value obtained is Q calculated > Q table, namely 5.64 > 4.20, so it can be concluded that H0 is rejected. This answers the third hypothesis, namely for low self-efficacy, there is a difference between the creative thinking abilities of students who are taught using the Problem Based Learning model and the discovery learning model in class XI MIPA students. In line with research conducted by Adinugraha (2017) which states that self-efficacy is self-confidence that comes from within students as a result of the learning experience process, they have undergone. Meanwhile, low self-efficacy tends to hinder the learning process.

Students who have high self-efficacy will be braver to explore lessons compared to those with low self-efficacy. The teacher's role in determining the learning model and convincing students is very necessary so that they achieve the desired learning goals. Students who were taught using the Problem Based Learning model with low self-efficacy obtained higher creative thinking ability scores compared to students who were taught using the discovery learning model. This is caused by students who have low self-efficacy not having the desire from within to participate in learning, being less enthusiastic about learning because the problem-based learning model requires independence and perseverance in learning. Apart from that, students expect more from teachers to be able to solve problems or issues that are considered difficult. Lack of creative ideas and problem solving that can be initiated by students. If one case example is given and given again with a different sentence, students will not have an idea to solve the problem.

There is no interaction between the learning model and self-efficacy on students' creative thinking abilities. The fourth hypothesis of interaction effects with sources of variance in learning models and self-efficacy produces Fcount = 0.74 and Ftable = 4.35 (Fcount ≤ Ftable) so that H0 is accepted and H1 is rejected. This means that students who are taught using the learning model have no interaction with students who have high or low self-efficacy. If we look at high self-efficacy, the ability to think creatively in classes taught using Problem Based Learning gets a higher score than students taught using discovery learning. The same thing also happened in the low self-efficacy group, where the creative thinking abilities of the experimental class taught using the Problem BasedLlearning model obtained a higher score than the control class taught using the discovery learning model.

This research was conducted to determine the influence of the problem based learning model and the discovery learning model as seen from the differences in self-efficacy on creative thinking abilities in class XI MIPA students at SMA Negeri 11 Takalar. From this research, it is known that problem-based learning has an influence on students to further improve their creative thinking abilities in solving problems. Because learning with problem-based application provides students with the opportunity to decide what experiences to focus on, which is carried out in confronting students with real problems in everyday life, so that students can develop their own knowledge in solving problems and try to find various kinds of solutions. and encourage students to think creatively.

## Conclusion

Based on the results of the analysis and discussion described in the previous chapter, it can be concluded as follows: Overall, there is a significant difference in creative thinking abilities between students who are taught using the problem based learning model and those taught using the discovery learning model in class XI MIPA students Takalar 11 Public High School. For students who have high self-efficacy, there is a significant difference in creative thinking abilities between students who are taught using the problem based learning model and those taught using the discovery learning model in class XI MIPA students at SMA Negeri 11 Takalar. For students who have low self-efficacy, there is a significant difference in creative thinking abilities between students who are taught using the problem based learning model and those taught using the discovery learning model in class XI MIPA students at SMA Negeri 11 Takalar. There is no interaction between the learning model and self-efficacy on the achievement of creative thinking abilities of class XI MIPA students at SMA Negeri 11 Takalar.

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**Author Contributions**

Nur Iftitah conceptualized research ideas, research methods, analyzing data, funding acquisition, investigation process, writing original draft, visualization, management, and coordinating responsibility for the research activity. Muhammad Arsyad and Pariabti Palloan guided the writing of the review and editing, supervision and validation of the instruments used in the research.

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**Conflicts of Interest**

The authors declare no conflict of interest. The data published in this article, both in the stages of data collection, interpretation and data analysis in writing the manuscript or the decision to publish research results, does not have a conflict of interest for any party.

## References

Adinugraha, F. (2017). Pengaruh Model Pembelajaran Dan Efikasi Diri Terhadap Sikap Ilmiah Siswa Sma Peminatan MIPA. *Jurnal Pro Life,* 4(3), 441-455. https://doi.org/10.33541/jpvol6Iss2pp102

Arisanti, W. O. L., Sopandi, W., & Widodo, A. (2017). Analisis Penguasaan Konsep Dan Keterampilan Berpikir Kreatif Siswa SD Melalui Project Based Learning. *Jurnal Pendidikan Dasar, 8*(1), 82. https://dx.doi.org/10.17509/eh.v8i1.5125

Astika, I.K.U., Suma, K., & Suastra, W. (2013). Pengaruh Model Pembelajaran Berbasis Masalah (Problem Based Learning) Terhadap Sikap Ilmiah dan Keterampilan Berpikir Kritis. *Jurnal Pendidikan IPA Ganesha, 3*(1). Retrieved from https://ejournal-pasca.undiksha.ac.id/index.php/jurnal_ipa/article/view/851

Armandita, P., Wijayanto, E., Rofiatus, L., Susanti, A., & Rumiana, S. (2017). Analisis Kemampuan Berpikir Kreatif Pembelajaran Fisika di Kelas XI MIA. *Jurnal Penelitian Ilmu Pendidikan*, *19*(2). https://doi.org/10.21831/jpipfip.v10i2.17906

Azmi, M. K., Rahayu, S., & Hikmawati. (2016). Pengaruh Model Problem Based Learning dengan Metode Eksperimen dan Diskusi Terhadap Hasil Belajar Fisika Ditinjau dari Sikap Ilmiah Siswa Kelas X MIPA SMA N 1 Mataram. *Jurnal Pendidikan Fisika dan Teknologi*, 2(2), 86-94. https://doi.org/10.29303/jpft.v2i2.294

Basith, A., Syahputra, A., & Ichwanto, M. (2020). Academic Self-Efficacy as Predictor of Academic Achievement. *JPI (Jurnal Pendidikan Indonesia)*, *9*(1). https://doi.org/10.23887/jpi-undiksha.v9i1.24403

Emsir. (2017). *Metodologi Penelitian Pendidikan: kuantitatif dan kualitatif.* Depok: Rajawali pers

Ersoy, E., U ysal, O. ve Başer, N. (2010). The Effects of Problem-based Learning Method in Higher Education on Creative Thinking. *Procedia-Social and Behavioral Sciences*, *116*, 3494-3498. https://doi.org/10.1016/j.sbspro.2014.01.790

Firdausi, Y. N., & Asikin, M. (2018). Analisis Kemampuan Berpikir Kreatif Siswa Ditinjau dari Gaya Belajar pada Pembelajaran Model Eliciting Activities (MEA). *Jurnal UNESA*, *1*, 239–247. Retrieved from https://journal.unnes.ac.id/sju/index.php/prisma/article/view/19582

Ghufron, M.N. dan Risnawati, R. (2016). *Teori-Teori Psikologi*. Yogyakarta: Ar Ruzz Media.

Hadriwani, Jamaluddin, Karnan & Yamin. (2022). Pengaruh Model Problem Based Learning Berbantuan Multimedia Animaker Terhadap Hasil Belajar IPA Siswa Kelas VIII MTs Negeri 2 Lombok Barat. *Jurnal Ilmiah Profesi Pendidikan*, 7(4). https://doi.org/10.29303/jipp.v7i4.848

Horsan. (2014). *Pendekatan Saintitifik dan Kontekstual dalam Pembelajaran Abad 21*. Bogor: Ghalia Indonesia

Ishak, M., Jekti, D.S.D., & Sridana, N. (2017). Pengaruh Penerapan Pendekatan Saintifik Menggunakan Model Pembelajaran Discovery dan Kooperatif Tipe STAD Terhadap Kemampuan Berpikir Kreatif Peserta Didik. *Jurnal Pijar MIPA*, 7(1). https://doi.org/10.29303/jpm.v12i1.326

Juniarso, T. (2020). Model Discovery Learning Terhadap Kemampuan Berpikir Kreatif. *Jurnal ELSE (Elementary School Education,* 4(1), 2581-1800. https://doi.org/10.30651/else.v4i1.4197

Joolingen, W.V. (1999). Cognitive tools for discovery learning. *International Journal of Artificial Intelligence in Education (IJAIED), 10*(3), 385-397. Retrieved from https://www.researchgate.net/publication/322294 83_Cognitive_tools_for_discovery_learning

Kaharuddin, Ali M. Sidin & Arsyad, M. (2020). *Pengaruh Efikasi Diri Dan Perhatian Orang Tua Terhadap Hasil Belajar Fisika Pada Peserta Didik SMA Negeri 3 Wajo*. Master Thesis, Universitass Negeri Makassar. Retrieved from http://eprints.unm.ac.id/18773/

Kemendikbud. (2013). *Materi Pelatihan Implementasi Kurikulum 2013*. Jakarta: Kementrian Pendidikan dan Kebudayaan.

Simanjuntak., Mariati, P., Hutahean., Juniar, Nurliana & Dewi. (2021) Effectiveness of Problem-Based Learning Combined with Computer Simulation on Students' Problem-Solving and Creative Thinking Skills. 2021. *International Journal of Instructio*n, 14(3),

199-534. Retrieved from https://files.eric.ed.gov/fulltext/EJ1304603.pdf

Oktalia & Sapri. (2017). Pengaruh Model Pembelajaran dan Efikasi Diri Terhadap Prestasi. *Jurnal Teknologi Pendidikan, 17*(2). Retrieved from https://ejournal.unib.ac.id/index.php/diadik/article/download/3682/1927

Ormrod, J. E. (2009). *Psikologi Pendidikan Membantu Siswa Tumbuh dan Berkembang Edisi keenam*. Jakarta: Erlangga

Ridwan, Y., Zuhdi, M., Kosim & Sahidu, H. (2021). Pengembangan Media Pembelajaran Interaktif Berbasis Model Problem Based Learning Untuk Meningkatkan Kemampuan Berpikir Kreatif Fisika Peserta Didik. *Jurnal Hasil Kajian, Inovasi, dan Aplikasi Pendidikan Fisika*, 7(1). https://doi.org/10.31764/orbita.v7i1.3832

Retnawati, Heri. (2016). *Analisis Kuantitatif Instrumen Penelitian*. Yogyakarta: Parama Publishing.

Sari, W.P, Sahidu, H & Harjono, A. (2022). Efektivitas Perangkat Pembelajaran Fisika Berbasis Discovery berbantuan Simulasi PhET untuk Meningkatkan Keterampilan Berpikir Kreatif Peserta Didik. *Jurnal ilmiah profesi Pendidikan, 7*(2), 995–1000. http://doi.org/10.29303/jipp.v7i2c.437

Siswono, T. (2006). Desain Tugas untuk Mengidentifikasi Kemampuan Berpikir Kreatif Siswa. *Jurnal Tata,* 1(1), 1-14. Retrieved from https://tatagyes.files.wordpress.com/2007/10/tatag_jurnal_unej.pdf

Supardi. (2013). *Aplikasi Statistika dalam Penelitian Konsep Statistika yang lebih Komprehensif.* Jakarta: PT. Prima Ufuk Semesta

Supardi. (2017). *Statistika Penelitian Pendidikan.* Depok: PT Raja Grafindo Persada

Susi, M. Arsyad & Khaeruddin. (2021). Pengaruh pembelajaran berbasis maslah dan kemampuan komunikasi terhadap keterampilan berpikir kritis fisika peserta didik. *Jurnal SEMNAS PMSGK*, 2(1). https://doi.org/10.30872/msgk.v2i1.751

Yuliatin, B. H., Purwoko, A. A., Muntari, M., & Mutiah, M. (2021). Hubungan Antara Sikap Ilmiah dan Kemampuan berpikir Kreatif Pada Mahasiswa Pendidikan Kimia di Universitas Mataram. *Chemistery Education Practice, 4*(3), 256-261. https://doi.org/10.29303/cep.v4i3.2733

Zarvianti, E., & Sahida, D. (2020). Designing Comics by Using Problem Based Learning (PBL) to Improve Student's Creative Thinking Skills. *International Journal of Social Learning, 1*(1), 75-88. https://doi.org/10.47134/ijsl.v1i1.8

Zulkarnaen, Z., Suhirman, S., Hidayat, S., Prayogi, S., Sarnita, F., Widia, W., Fathurrahmaniah, F., Fauzi, A., Ramdhani, L., & Verawati, N. N. S. P. (2022). The Effect of Problem Based Learning Model on Students' Creative Thinking Ability. *Jurnal Penelitian Pendidikan IPA, 8*(1), 379–382. https://doi.org/10.29303/jppipa.v8i1.1307