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THE EFFECT OF BLENDED PROBLEM BASED LEARNING AND INDEPENDENCE ON LEARNING OUTCOMES CHEMICAL COURSES

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ABSTRACT

The purpose of this study is to determine the test results: (1) The Effect of Differences in Learning Outcomes between students who study with the Blended-Problem Based Learning model and the Problem Based Learning model in chemistry subjects, (2) Influence between the differences in student learning outcomes who have high and low independence in chemistry subjects, and (3) the interaction between the Blended-Problem Based Learning model and independent learning on the learning outcomes of chemistry subjects. This experimental research was carried out using a 2x2 factorial design. The subjects in this study were students of class X which consisted of four classes with 120 students. The subjects that became the focus of the experiment were taken classically randomly, namely four classes of Mathematics and Natural Sciences1,2,3,4. The research hypothesis was tested using the Analysis of Variant (Anova) statistical test. The results of the calculation show that: (1) There are differences in the effect of the use of the Blended-Problem Based Learning Model and Problem Based Learning Learning Model on students' chemistry learning outcomes, (2) There are differences in the effect of high learning independence and low learning independence on student learning outcomes, and (3) There is an interaction effect between the learning model and independent learning on students' chemistry learning outcomes. Based on the results of the study, it was concluded that using the Blended-Problem Based Learning Model, Problem Based Learning model, and independence could improve students' Chemistry Learning Outcomes.

1. Introduction

The learning process is essentially in learning activities, which are students who learn independently. Therefore, in the learning process the teacher should provide direction to students on how to learn. Now we are faced with a new era with a scientific-based curriculum paradigm (Ramadan et al., 2021; Rantikasari, 2021; Rosyad & Maarif, 2020; Wahyono et al., 2020). The scientific approach in the learning process includes digging up information through observation, asking, experimenting, then processing data or information, presenting data or information, followed by analyzing, reasoning, then concluding, and creating (Laely & Subiyanto, 2021; Patricia & Zamzam, 2021; Perwita et al., 2021; Yusup et al., 2021).

The implementation of a new curriculum or an active student-oriented learning strategy (student oriented learning) (Haenilah et al., 2021; Putri et al., 2021; Suyanto, 2018). Facts in the field show that chemistry learning is still considered a boring lesson for students because the method used is still the Problem Based Learning model so that it seems monotonous (Guyansyah, 2020; Rikawati & Sitinjak, 2020; Savira et al., 2018). Certain learning systems that do not provide optimal services to students are considered less involved in innovation in learning (Kamdi, 2011; Narmaditya et al., 2021; Setyarini, 2010; Suciati, 2019). So it can be said that today's teaching and learning has changed, from teacher-centered to student-centered, from active teacher learning to active student learning.

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The existence of these problems is due to not applying the active learning model in chemistry learning. Basically, the principle of chemistry learning is to emphasize students to learn chemical concepts in a coherent, structured and detailed manner. In the process, students not only memorize theories, formulas, and chemical reactions, but students should be able to understand chemical concepts properly and precisely. Therefore, it is necessary to apply an active learning model for students to better understand the concept, so that it can improve learning independence, especially in problem solving (Linda* et al., 2021; Sari et al., 2021; Supardi et al., 2021).

Learning independence will increase if students can be trained with the application of models such as problem-based learning, because it will be more demanding for students to explore, discover and solve problems themselves (Qomariyah & Wulandari, 2021; Rikizaputra et al., 2021; Saprizal et al., 2021; Yulianto, 2021). The Problem Based Learning model is a learning model that provides students with various authentic and meaningful problem situations, which can serve as a springboard for investigations and investigations (Dumanaw et al., 2021; Fatimah et al., 2017; Hsia et al., 2021).). In implementing problem-based learning, the development of technology can be utilized optimally by students in the learning process. Current technological literacy can be seen with the emergence of Blended Learning, which is a learning process that can combine face-to-face learning in class and online learning (e-learning) (Kim, 2021; Kuo et al., 2021; Yuan et al., 2020) . Because it combines Blended Learning in problem-based learning, it will be known as Blended-Problem Based Learning (Erickson et al., 2021; Herliana et al., 2020; Hmelo-Silver et al., 2007).

The Blended-Problem Based Learning model can provide students with the breadth to search, observe, and analyze a problem associated with the subject matter (Marnita et al., 2020; Putra et al., 2021; Yahya & Hashim, 2021). This process can be carried out independently or in collaboration with group friends and teachers, so that students can improve their exploratory abilities oriented to independent learning (Ma'arif & Murdiono, 2021; Sutrisno AB, 2021; Wulandari et al., 2021). Researchers hope that the Blended-Problem Based Learning model can motivate student learning activities, this can improve the learning outcomes that have been achieved after using the Blended-Problem Based Learning learning model (Anggraini & Syahbrudin, 2021; Rewah et al., 2021; Rusdiana et al. al., 2020).

2. Methods

This research is an experimental study using a 2x2 factorial design with the following variables: (1) independent variable, Blended Problem Based Learning, (2) moderator variable, namely independent learning (3) dependent variable, namely chemistry learning outcomes. The population used in this study were all students of class VI, amounting to 120 students. The author deliberately chose the population in this location because as a place to teach the author and wanted to know the extent to which the success of Blended Problem Based Learning and Independence in Chemistry Subject Learning Outcomes.

The instruments used in this study were 2 kinds of instruments, namely (1) Learning Independence Test, and (2) Learning Outcome Test. The Learning Outcomes Test Instrument used in this study was a test in the form of an essay with a total of 10 questions. Written tests are used to measure the ability of student learning outcomes after being given treatment so that teachers can measure the level of student success. This study will obtain data in the form of learning outcomes scores obtained through written tests.

The sequence of data collection is carried out as follows: (1) Conducting observations to determine the classes that will be used as groups of research subjects and determine experimental classes that will be treated with problem-based learning, (2) Provide independent learning tests, (3) Giving treatment (treatment) to the class that is the subject of research with problem-based learning treatment, (4) Providing ability tests in both experimental and control classes with the same questions, (5) Assessing test results obtained from the treatment group, namely the experimental class is taught using Blended Problem Based Learning, and the control class is taught using the Problem Based Learning method for further analysis and preparation of the data obtained. In this study, the statistical analysis used in analyzing the research data was the two-way analysis of variance (ANAVA) technique.

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3. Results and Discusion

3.1 Results

The descriptive results of this experimental class are as follows:

Table 1. Research Descriptive Test Results

Descriptive Statistics

Dependent Variable: HASIL BELAJAR KIMIA

METODE	KEMANDIRIAN	Mean	Std. Deviation	N
Blended-Problem Based Learning	TINGGI	70.3611	6.74072	36
	RENDAH	75.6667	5.59244	24
	Total	72.4833	6.78356	60
Problem Based Learning	TINGGI	62.3077	1.79743	13
	RENDAH	62.6170	1.87145	47
	Total	62.5500	1.84506	60
Total	TINGGI	68.2245	6.84430	49
	RENDAH	67.0282	7.15736	71
	Total	67.5167	7.02694	120

Based on table 1, it can be explained that the students involved in this study were 4 classes X-MIPA1,2 and MIPA-3,4 at SMAN I Sangkapura with a total of 120 students, where in the implementation of this learning the sample was chosen randomly, which selected are Class X-MIPA1,2 and Class X-MIPA3,4. The implementation of learning that is applied to Class X-MIPA1,2 is to use the Blended-Problem Based Learning model and Class X-MIPA3,4 is to use the Problem Based Learning model.

Table 1 explains that the Blended-Problem Based Learning and Problem Based Learning learning models that are applied can improve students' chemistry learning outcomes, as indicated by the final chemistry learning outcomes obtained by students. For class X-MIPA1,2 in general there is a significant increase where at the beginning of learning has an average of 70 while at the end of learning the learning outcomes of Chemistry obtained are 82.57, Likewise for class X-MIPA3,4 which applies the Model Learning Problem Based Learning there is a significant increase as well where at the beginning of learning has an average of 74 while at the end of learning Chemistry learning outcomes obtained are 78.71.

And based on observations and calculation results, it is known that the Blended-Problem Based Learning learning model has more students who have high independence and with a better average score, as well as the Problem Based Learning learning model where students who have high independence are more than low independence students. And overall, students are more likely to have high independence in the Blended-Problem Based Learning and Problem Based Learning learning models.

Based on the table above, it can be explained that in general there are differences between the application of the Blended-Problem Based Learning model or the application of the Problem Based Learning learning model, both for students who have high independence or students who have low independence. Based on the results of this descriptive calculation, it can be explained that there are differences in chemistry learning outcomes between students who are taught using the Blended-Problem Based Learning learning model and those taught using the Problem Based Learning learning model in students with high independence and students with low independence even to see the difference. significant or insignificant evidence is required by statistical calculations.

With regard to the 2-factor analysis of variance, it can be seen in the following table.

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Table 2. Test Results of 2-Factor Analysis of Variance

Tests of Between-Subjects Effects

Dependent Variable: HASIL BELAJAR KIMIA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3366.452[a]	3	1122.151	51.870	.000
Intercept	437923.226	1	437923.226	20242.598	.000
METODE	2656.457	1	2656.457	122.792	.000
KEMANDIRIAN	188.059	1	188.059	8.693	.004
METODE * KEMANDIRIAN	148.900	1	148.900	6.883	.010
Error	2509.515	116	21.634		
Total	552896.000	120			
Corrected Total	5875.967	119			

a. R Squared = .573 (Adjusted R Squared = .562)

Based on table 2, it can be explained regarding the Blended-Problem Based Learning model and the Problem Based Learning learning model, and the independence and interaction between the application of the Blended-Problem Based Learning learning model and the Problem Based Learning learning model and independence with the following results.

a. Application of the Blended-Problem Based Learning and Problem Based Learning learning models with a significance value smaller than < 0.05, i.e. 0.000, so it can be explained that there are differences in the chemistry learning outcomes of class X students between those taught using the Problem Based learning model. Learning and learning models Blended-Problem Based Learning at SMAN I Sangkapura.
b. Student independence with a significance value less than < 0.05, which is 0.004, meaning that there is a difference in the chemistry learning outcomes of class X students between those who have high independence and those who have low independence at SMAN I Sangkapura.
c. Interaction of Blended-Problem Based Learning and Problem Based Learning learning models with a significance value smaller than < 0.05, i.e. 0.010, so that there is an interaction between Problem Based Learning and Blended-Problem Based Learning learning models and independence towards results. studying Chemistry for class X students at SMAN I Sangkapura.

Based on the results of research and calculations carried out using the analysis of variance of the two factors, it can be explained that in general, this is related to the hypotheses that have been given previously. Based on this calculation, it can be explained that all hypotheses can be accepted based on calculations using two-way analysis of variance. In detail, regarding the hypothesis that has been proposed, it can be explained that in this study there are differences in chemistry learning outcomes caused by the use of the Blended-Problem Based Learning model and the Problem Based Learning learning model in students with high independence and low independence, resulting in an interaction between the use of learning methods applied to the learning outcomes of Chemistry. Where in this study, the use of the Blended-Problem Based Learning learning model is more able to improve student chemistry learning outcomes compared to the use of the Problem Based Learning learning model. In addition, students with high independence also have better chemistry learning outcomes than students with low independence.

The results of the three hypothesis tests carried out using SPSS 25, then all the hypotheses proposed in this study were all proven, because the results of data analysis showed significant figures.

There is a significant result that there is an interaction between the application of the Blended-Problem Based Learning model and the Problem Based Learning learning model with independence in Chemistry learning outcomes, which is also reinforced by Figure 1 as follows:

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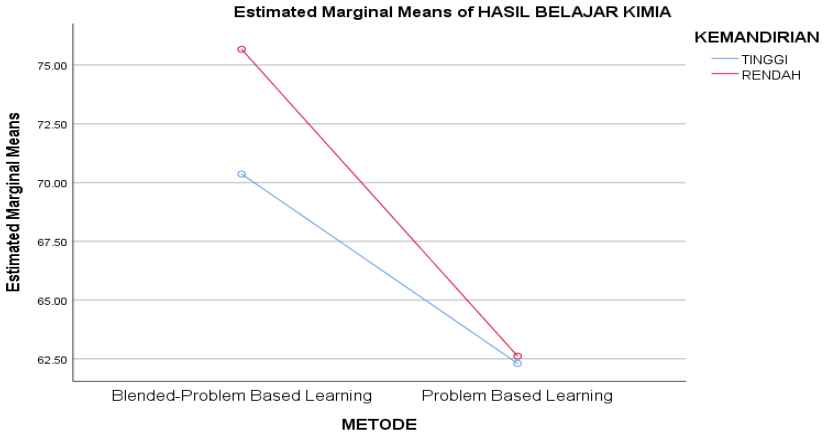

Figure 1. Interaction of Blended-Problem Based Learning learning model and Problem Based Learning learning model with independence on Chemistry learning outcomes.

Figure 1 shows that there is a meeting line or intersection of chemistry learning outcomes data between low and high independence in the control group (Problem Based Learning Model) and the experimental group (Blend-Problem Based Learning Model).

3.2 Discusion

a. There is a Difference in Chemistry Learning Outcomes of Class X Students Between Those Who Are Taught Using The Problem Based Learning Model and the Blended-Problem Based Learning Model At SMAN I Sangkapura

The use of varied learning methods allows interaction in the teaching and learning process so as to create reciprocal communication between teachers and students, and students and students. In fact, the size of the variation in interaction depends on the teaching method used.

The variation of the PBL learning model is a variation of the learning method in which a teacher has carried out learning activities applying the lecture method and then combined or followed by the discussion method. In other words, where a teacher first conveys lesson material by presenting it orally to students, then students or students are assigned to have scientific conversations.

Based on the results of data analysis, a summary table of hypothesis 1 testing will be displayed which will be used as the basis for testing hypothesis 1 research.

The significance value is 0.000. This shows that (Ha is accepted) means that there is a difference in the chemistry learning outcomes of class X students between those taught using the problem-based learning model and the blended-problem-based learning model at SMAN I Sangkapura.

Learning with the Blended-Problem Based Learning Model was developed in the medical field. PBL is only a learning strategy developed with the aim of making learning run more productive and meaningful. The Blended-Problem Based Learning learning model can be run without having to change the existing curriculum and order.

One of the philosophies underlying the Blended-Problem Based Learning Model is that art is not a complete set of rules or characteristics that students must learn. The Blended-Problem Based Learning learning model aims to equip students with knowledge that can be flexibly applied (Blended) from one problem to another and from one context to another. Define Blended is the ability to think and argue about new situations through the use of Problem Based Learning. It can have a positive connotation if learning or problem solving is improved through the use of Problem Based Learning. It can have a negative connotation if Problem Based Learning significantly interferes with the learning process. Blended can also occur in a context through giving assignments that are closely related to the subject matter, or certain situations, and then used in other contexts.

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There are several characteristics that stand out in learning are psychomotor. The first characteristic is the use of problems or questions with a concrete real-life context (contextual) or those in the minds of students as a starting point for the learning process. The problems can be presented in plain language or stories.

Jong at.al. (2014) that Blended learning activities can be efficient and interesting. Synchronous Blended Communication is used in the cases described. Asynchronous communication is more flexible, asynchronous communication in the form of feedback via discussion forums is highly appreciated for bringing structure to an open project. In both synchronous and asynchronous Blended communication, the rules of interaction and communication are important, even more important than in face-to-face sessions. Blended learning is an important medium for the future. The combination of face-to-face and online activities is interesting. Integrated learning can even make it easier to realize collaborative learning between professionals, Ikuo Shimizu Hideyuki at.al. (2019) that research results reveal that the effectiveness of PBL can be strengthened by combining it with e-learning; In addition, learning independence and self-efficacy of students increased. Thus, the more students become independent learners, the higher their acceptance of technology in PBL will be. By adding an e-learning element in PBL, we can stimulate knowledge development in a student-centered manner, thereby supporting self-efficacy and independent learning without compromising the authority of the tutor, Ron Oliver (2011) that the findings of this study seem to provide strong support for the premise that Problem-based teaching approaches delivered using blended learning involving web-based tools and hands-on instruction can provide strong support for students. Most of the students showed a positive level of satisfaction with the learning approach and indicated that the approach supported their learning. The form and type of problems were found to affect the level of student satisfaction with more practical and relevant problems being preferred over those considered theoretical and less applied.

This clarity has proven that by designing blended learning using problem-based learning strategies, besides being able to improve student learning outcomes, with this development strategy, students' creativity, communication and collaboration levels are more comfortable and increase independent learning for each student.

b. There is a difference in the chemistry learning outcomes of class X students between those who have high independence and those who have low independence at SMAN I Sangkapura.

From the statistical test results listed in the table above, the following results were obtained: The significance value was 0.004. This shows that there is an interaction between the use of learning models and learning independence to improve student learning outcomes, in other words that the learning model and the level of learning independence, together can significantly improve student learning outcomes.

Independence is one of the important and decisive factors in the learning process, the success of educational organizations in achieving goals largely depends on the willingness of students to learn and excel. Therefore, education providers including teachers and parents must strive so that students who are educated have high independence to learn and achieve.

Independence relates to a person's psychological factors that reflect the relationship or interaction between attitudes, needs, and satisfaction that occurs in humans.

Independence is an effort to achieve success, which aims to succeed in competing with a measure of excellence. The measure of excellence that is meant in this case is in the form of other people's achievements, but it can also be the person's own achievements that were achieved in the past. In other words, independence is one of the factors that greatly influences a person's behavior in doing a job, actions or activities towards achieving the goals that have been set.

Based on the definitions of independence and a description of the characteristics of high independence as stated above, it can be concluded that independence is a process of generating motion in a person to take action so as to achieve the best possible results.

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The main purpose of tutoring provided by the teacher is to develop all the abilities of students so that they can successfully develop their lives at a more appropriate level or situation. Independence serves to lead students through the process of providing assistance to individuals and groups so that they are able to adapt themselves well to school, family and society.

According to Oemar Hamalik, (1994) one of the repetition techniques is review or reteaching which means repeating or re-learning the materials that have been taught with the intention of gaining understanding, expanding or deepening and clarifying the materials that have been taught.

Previous research has proven as has been done, among others: Dawson R. Hancock (2010) which proved that graduate students who were exposed to verbal praise well administered by a professor performed significantly better on exams administered by the professor, spent more time to do homework and show higher independence to study in class than accepting students. no verbal praise. Characteristics of effective verbal praise that contributed to these results, the potential uses of verbal praise as reinforcement of student independence and direction for future research are discussed, Teresa K. Debacker & R. Michael Nelson (2010) concluded that From independence Boys have higher scores than independent girls in terms of perception of ability and stereotyped views about science. Ari Riswanto, Sri Aryani (2017) get student learning independence in two subjects that are used as references, in the class having excellent and very good independence, it is important for students to get facilities in order to generate better learning independence

c. There is an interaction between the Problem Based Learning Model and the Blended-Problem Based Learning and Independence Learning Model on the Chemistry Learning Outcomes of Class X Students at SMAN I Sangkapura

Students who have independent learning can be seen through the attitude of these students in terms of liking to choose learning models, because it needs to be realized that the selection of learning methods is closely related to the subject matter being studied, so it can be said that the selection of the right learning method will be able to generate student learning independence.

From the statistical test results listed in the table above, the following results were obtained: The significance value was 0.010. This shows that there is an interaction between the use of learning models and learning independence to improve student learning outcomes, in other words that the learning model and the level of learning independence, together can significantly improve student learning outcomes.

The learning model aims to provide students with knowledge that can be flexibly applied (Blended) from one problem to another and from one context to another. Define Blended is the ability to think and argue about new situations through the use of Problem Based Learning. It can have a positive connotation if learning or problem solving is enhanced through the use of prior knowledge. It can have a negative connotation if prior knowledge significantly interferes with the learning process. Blended can also occur in a context through giving assignments that are closely related to the subject matter, or certain situations, and then used in other contexts.

If PBL learning is applied with high independence, it will be able to improve learning outcomes. This is reinforced by the opinion of M. Nur, (2000) that in order for learning to occur, students must take action on the new information and connect the new information with prior knowledge, namely the coding process strategy which is often called the repeat strategy.

Previous research that has been done has proven that the use of learning models has a good influence on improving learning outcomes, among others what has been done by Syaiful Islam at.al. (2018) found that the application of a learning model that had a significant effect on increasing learning independence turned out to be the basic capital for the next response in the form of increasing student achievement. However, it should be realized that independence is a complex psychological factor. Debra K. Meyer & Julianne C. Turner (2006) argue for a more integrated model that explains emotion as part of a collective experience that can explain emotion in terms of independence and learning as an integrated process, Graham (1991), "The theory of self-reliance that eligible for educational psychology must be able to combine emotions. However, the

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classroom is the site of several affective experiences with independent significance, including feelings associated with the success or failure of achievement, as well as acceptance or rejection by others.

From the opinion above, it can be concluded that in order for learning to occur that can improve learning outcomes, it is necessary to have a real approach to the learning model used. The research results show that the contextual learning process has shown satisfactory results.

4. Conclusion

Based on the results of hypothesis testing and discussion in chapter V, it can be concluded as follows: (1) There are differences in the effect of the use of the Blended-Problem Based Learning learning model and the Problem Based Learning learning model on the chemistry learning outcomes of class X students at SMAN I Sangkapura, namely students who using the Blended-Problem Based Learning learning model, their learning outcomes are better than students who use the PBL learning model, (2) There is a difference in the effect of high learning independence and low learning independence on the learning outcomes of class X students at SMAN I Sangkapura, namely students with high learning independence. higher learning outcomes have better learning outcomes than students with low learning independence, and (3) There is an interaction effect between learning models and learning independence on the chemistry learning outcomes of class X students at SMAN I Sangkapura, in this case independence as a moderator variable strongly supports a strong relationship between var independent variable and dependent variable. The effect of using the Blended-Problem Based Learning model with high independence can improve learning outcomes.

References

Anggraini, A., & Syahbrudin, J. (2021). Implementasi Blended Learning Berbasis Problem Solving Chat Untuk Meningkatkan Keterampilan Pemecahan Masalah. *Eduka : Jurnal Pendidikan, Hukum, Dan Bisnis*, *6*(1).

Dumanaw, V., Wonorahardjo, S., & Widarti, H. (2021). Application Of Model Problem Based Learning Assisted Blended Learning On Cognitive Knowledge Of University Students In Analytical Chemistry Instrument. *Jpp (Jurnal Pendidikan Dan Pembelajaran)*, *27*(2). Https://Doi.Org/10.17977/Um047v27i22020p073

Erickson, S., Neilson, C., O'halloran, R., Bruce, C., & Mclaughlin, E. (2021). 'I Was Quite Surprised It Worked So Well': Student And Facilitator Perspectives Of Synchronous Online Problem Based Learning. *Innovations In Education And Teaching International*, *58*(3). Https://Doi.Org/10.1080/14703297.2020.1752281

Fatimah, L., Maulana, M., & 'Atun, I. I. (2017). Pengaruh Problem- Based Learning (Pbl) Berstrategi " Murder ." *Jurnal Pena Ilmiah*.

Guyansyah, A. (2020). Penyuluhan Dengan Metode Ceramah Untuk Meningkatkan Pengetahuan Kesehatan Reproduksi Pada Masa Menopause. *Juara: Jurnal Wahana Abdimas Sejahtera*, *1*(2). Https://Doi.Org/10.25105/Juara.V1i2.5680

Haenilah, E. Y., Yanzi, H., & Drupadi, R. (2021). The Effect Of The Scientific Approach-Based Learning On Problem Solving Skills In Early Childhood: Preliminary Study. *International Journal Of Instruction*, *14*(2). Https://Doi.Org/10.29333/Iji.2021.14217a

Herliana, F., Astra, I. M., Supriyati, Y., Mazlina, H., & Musdar. (2020). The Differences In Physics Learning Outcomes Based On Gender After Using Blended Problem-Based Learning Model. *Journal Of Physics: Conference Series*, *1460*(1). Https://Doi.Org/10.1088/1742-6596/1460/1/012125

Hmelo-Silver, C. E., Duncan, R. G., & Chinn, C. A. (2007). Scaffolding And Achievement In Problem-Based And Inquiry Learning: A Response To Kirschner, Sweller, And Clark (2006). In *Educational Psychologist*. Https://Doi.Org/10.1080/00461520701263368

Hsia, C. H., Lai, C. F., & Su, Y. S. (2021). Impact Of Using Arcs Model And Problem-Based Leaning On Human Interaction With Robot And Motivation. *Library Hi Tech*. Https://Doi.Org/10.1108/Lht-07-2020-0182

Kamdi, W. (2011). Paradigma Baru Pendidikan Teknologi Dan Kejuruan: Kerangka Pikir Inovasi Pembelajaran. *Teknologi Dan Kejuruan Kejuruan*.

Https://Doi.Org/Http://Dx.Doi.Org/10.17977/Tk.V34i1.3022

Kim, Y. (2021). The Problem / Project-Based Learning (Pbl / Pjbl) At Online Classes. *International Journal Advanced Culture Technology*, *9*(1).

Kuo, H. C., Yang, Y. T. C., Chen, J. S., Hou, T. W., & Ho, M. T. (2021). The Impact Of Design Thinking Pbl Robot Course On College Students' Learning Motivation And Creative Thinking. *Ieee Transactions On Education*. Https://Doi.Org/10.1109/Te.2021.3098295

Laely, K., & Subiyanto, S. (2021). Implementasi Scientific Approach Dalam Mengembangkan Multiple Intelligences Anak Usia Dini. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *5*(2). Https://Doi.Org/10.31004/Obsesi.V5i2.730

Linda*, R., Zulfarina, Z., Mas'ud, M., & Putra, T. P. (2021). Peningkatan Kemandirian Dan Hasil Belajar Peserta Didik Melalui Implementasi E-Modul Interaktif Ipa Terpadu Tipe Connected Pada Materi Energi Smp/Mts. *Jurnal Pendidikan Sains Indonesia*, *9*(2). Https://Doi.Org/10.24815/Jpsi.V9i2.19012

Ma'arif, M., & Murdiono, M. (2021). Pengaruh Pemanfaatan Aplikasi Google Classroom Terhadap Karakter Kemandirian Dan Hasil Belajar Peserta Didik Di Sekolah Menengah Pertama. *Belantika Pendidikan*, *4*(1). Https://Doi.Org/10.47213/Bp.V4i1.104

Marnita, Taufiq, M., Iskandar, & Rahmi. (2020). The Effect Of Blended Learning Problem-Based Instruction Model On Students' Critical Thinking Ability In Thermodynamic Course. *Jurnal Pendidikan Ipa Indonesia*, *9*(3). Https://Doi.Org/10.15294/Jpii.V9i3.23144

Narmaditya, B. S., Megasari, R., Wahjoedi, & Hardinto, P. (2021). Peningkatan Inovasi Pembelajaran Melalui Pengembangan Konten Pembelajaran Daring. *Jurnal Karinov*, *4*(1).

Patricia, F. A., & Zamzam, K. F. (2021). Development Of Scientific Approach-Based Interactive Multimedia For Elementary School Dyscalculia Children. *Jurnal Prima Edukasia*, *9*(1). Https://Doi.Org/10.21831/Jpe.V9i1.33853

Perwita, T., Asmana, C. H., & Arifani, Y. (2021). Mobile-Assisted Language Learning Based Using Scientific Approach To Improve Students Vocabulary. *Journal Of English Teaching, Literature, And Applied Linguistics*, *4*(1). Https://Doi.Org/10.30587/Jetlal.V4i1.2390

Putra, A. G. P., Bektiarso, S., & Handayani, R. D. (2021). Pengaruh Model Problem Based Learning (Pbl) Terhadap Hasil Belajar Dan Keterampilan Proses Sains Dalam Pembelajaran Fisika Di Sma (Kelas X Sma Negeri 3 Jember). *Jurnal Pembelajaran Fisika*, *5*(2).

Putri, K., Muchtar, Z., & Darmana, A. (2021). Develop An Android-Based Learning Media Integrated With A Scientific Approach To The Colligative Solution's Nature. *Budapest International Research And Critics In Linguistics And Education (Birle) Journal*, *4*(1). Https://Doi.Org/10.33258/Birle.V4i1.1605

Qomariyah, A. N., & Wulandari, S. S. (2021). Pengaruh Kemandirian Belajar Dan Sarana Prasarana Pembelajaran Terhadap Hasil Belajar Siswa. *Jurnal Pendidikan Edutama*, *8*(2). Https://Doi.Org/10.30734/Jpe.V8i2.1475

Ramadan, E. M., Jumadi, J., & Rahmawati, D. U. (2021). The Effectiveness Of Physics Learning Online Based On Guided Discovery Models To Improve Critical Thinking Skill. *Proceedings Of The 7th International Conference On Research, Implementation, And Education Of Mathematics And Sciences (Icriems 2020), 528*. Https://Doi.Org/10.2991/Assehr.K.210305.073

Rantikasari. (2021). Paradigma Baru Model Pendidikan Berbasis Keluarga (Homeschcooling). *Rayah Al-Islam*, *5*(01). Https://Doi.Org/10.37274/Rais.V5i1.399

Rewah, V., Sulangi, V., & Salajang, S. (2021). Development Of Learning Devices With The Pbl Model Using The Pythagoras Theorem Of Rme Approach. *Journal Of Physics: Conference Series*, *1968*(1). Https://Doi.Org/10.1088/1742-6596/1968/1/012050

Rikawati, K., & Sitinjak, D. (2020). Peningkatan Keaktifan Belajar Siswa Dengan Penggunaan Metode Ceramah Interaktif. *Journal Of Educational Chemistry (Jec)*, *2*(2). Https://Doi.Org/10.21580/Jec.2020.2.2.6059

Rikizaputra, R., Lufri, L., Andromeda, A., & Mufit, F. (2021). Analisis Kemandirian Belajar Dan Habits Of Mind Siswa Pada Pembelajaran Asesmen Portofolio. *Jurnal Penelitian Pendidikan Ipa*, *7*(2). Https://Doi.Org/10.29303/Jppipa.V7i2.630

Rosyad, A. M., & Maarif, M. A. (2020). Paradigma Pendidikan Demokrasi Dan Pendidikan Islam Dalam Menghadapi Tantangan Globalisasi Di Indonesia. *Nazhruna: Jurnal Pendidikan Islam*, *3*(1). Https://Doi.Org/10.31538/Nzh.V3i1.491

Rusdiana, A., Sulhan, M., Arifin, I. Z., & Kamludin, U. A. (2020). Penerapan Model Poe2we Berbasis

Blended Learning Google Classroom Pada Pembelajaran Masa Wfh Pandemic Covid-19. *Scientific Writing Of The Bandung State Islamic University 2020*.

Saprizal, A., Nindiasari, H., & Syamsuri, S. (2021). Analisis Kemandirian Belajar Matematika Pada Siswa Kelas Ix Smpn 7 Kota Serang Ditinjau Berdasarkan Gender. *Tirtamath: Jurnal Penelitian Dan Pengajaran Matematika*, *3*(1). Https://Doi.Org/10.48181/Tirtamath.V3i1.8954

Sari, P. P., Hidayah, N., Najibufahmi, M., & Pekalongan, U. (2021). Pengaruh Kemandirian Dan Kreativitas Belajar Terhadap Prestasi Belajar Matematika Dalam Pembelajaran Daring. *Jurnal Pendidikan Matematika*, *01*(01).

Savira, A. N., Fatmawati, R., Rozin Z, M., & Eko S, M. (2018). Peningkatan Minat Belajar Siswa Dengan Menggunakan Metode Ceramah Interaktif. *Factor M*, *1*(1). Https://Doi.Org/10.30762/F_M.V1i1.963

Setyarini, S. (2010). "Puppet Show": Inovasi Metode Pengajaran Bahasa Inggris Dalam Upaya Meningkatkan Kemampuan Berbicara Siswa Sd. *Jurnal Penelitian Pendidikan*.

Suciati, D. (2019). Difusi Inovasi Pendidikan. *Tangerang Selatan: Universitas Terbuka*.

Supardi, A., Nindiasari, H., & Syamsuri, S. (2021). Perbandingan Persepsi Dan Kemandirian Belajar Matematika Siswa Madrasah Terhadap Pembelajaran Daring Ditinjau Dari Kemampuan Awal Matematis. *Tirtamath: Jurnal Penelitian Dan Pengajaran Matematika*, *3*(1). Https://Doi.Org/10.48181/Tirtamath.V3i1.10145

Sutrisno Ab, J. (2021). Perbedaan Kemandirian Belajar Ditinjau Dari Gender Dan Disposisi Matematis. *Inomatika*, *3*(2). Https://Doi.Org/10.35438/Inomatika.V3i2.291

Suyanto, S. (2018). The Implementation Of The Scientific Approach Through 5ms Of The Revised Curriculum 2013 In Indonesia. *Cakrawala Pendidikan*, *37*(1). Https://Doi.Org/10.21831/Cp.V37i1.18719

Wahyono, P., Husamah, H., & Budi, A. S. (2020). Guru Profesional Di Masa Pandemi Covid-19: Review Implementasi, Tantangan, Dan Solusi Pembelajaran Daring. *Jurnal Pendidikan Profesi Guru*, *1*(1).

Wulandari, N. K. H., Puspadewi, K. R., & Noviyanti, P. L. (2021). Hubungan Antara Kecerdasan Emosional, Kemandirian Belajar Dan Kreativitas Belajar Dengan Hasil Belajar Matematika. *Jurnal Santiaji Pendidikan (Jsp)*, *11*(1). Https://Doi.Org/10.36733/Jsp.V11i1.1808

Yahya, M. S., & Hashim, H. (2021). Interdisciplinary Learning And Multiple Learning Approaches In Enhancing The Learning Of Esl Among Stem Learners. *Creative Education*, *12*(05). Https://Doi.Org/10.4236/Ce.2021.125078

Yuan, K., Aftoni, A., & Çobanoğlu, Ö. (2020). The Effect Of Problem-Based Learning Model And Blended Learning Model To Metacognitive Awareness As A Reflection Towards A New Normal Era. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *26*(2). Https://Doi.Org/10.21831/Jptk.V26i2.32783

Yulianto, L. (2021). Implementasi Gim Si Komdig's Journey Untuk Meningkatkan Motivasi Dan Kemandirian Belajar Di Masa Pandemi Covid-19. *Wacana Akademika: Majalah Ilmiah Kependidikan*, *5*(1). Https://Doi.Org/10.30738/Wa.V5i1.8532

Yusup, M., Marzani, M., & Paramita, M. (2021). The Influence Of The Scientific Approach On The Learning Interest. *Al-Ishlah: Jurnal Pendidikan*, *13*(1). Https://Doi.Org/10.35445/Alishlah.V13i1.456