Hybrid Learning Model: Its Impact on Mastery of Concepts and Self-Regulation in Newton's Second Law Material

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Abstract: This study examines the impact of the Hybrid Learning Model on concept mastery and self-regulation. The research method uses a 2x3 factorial design. After that, data collection used multiple-choice tests for concept mastery and questionnaires for self-regulation. Data analysis using two-way ANOVA with SPSS software. The study results indicate that there is an effect of mastery of concepts using Hybrid Learning and without Hybrid Learning, where the Hybrid Learning model is better than non-Hybrid learning. With students' concept mastery in Newton's Law II material, self-regulation ability is in line and mutually reinforcing. The high concept mastery ability is better than students in the medium and low self-regulation categories. The concept mastery ability in the medium concept mastery category is better than low self-regulation students in the medium concept mastery category. The results also show an influence between the Hybrid learning model and students' self-regulation abilities in the high, medium, and low categories on the ability to understand concepts.

Keywords: Hybrid Learning, Mastery of Concepts, Self-Regulation

Model Pembelajaran Hybrid: Dampaknya terhadap Penguasaan Konsep dan Self-Regulation pada Materi Hukum II Newton

Abstrak: Penelitian ini mengkaji dampak Model Pembelajaran Hybrid dalam penguasaan konsep dan *self-regulation*. Metode penelitian menggunakan desain faktorial 2x3. Setelah itu, pengumpulan data menggunakan tes pilihan ganda untuk penguasaan konsep dan angket untuk *self-regulation*. Analisis data menggunakan ANOVA dua arah dengan Software SPSS. Hasil penelitian menunjukkan adanya pengaruh penguasaan konsep dengan menggunakan Pembelajaran Hybrid dan tanpa Pembelajaran Hybrid, dimana model Pembelajaran Hibrid lebih baik daripada pembelajaran non-Hybrid. Kemampuan *self-regulation* dengan penguasaan konsep siswa pada materi Hukum Newton II sejalan dan saling menguatkan, dimana kemampuan penguasaan konsep tinggi lebih baik daripada siswa dengan kategori *self-regulation* sedang dan rendah dan kemampuan penguasaan konsep pada kategori penguasaan konsep sedang lebih baik daripada siswa dengan kategori *self-regulation* rendah. Hasil penelitian juga menunjukkan adanya pengaruh antara model pembelajaran Hybrid dan kemampuan *self-regulation* siswa dalam kategori tinggi, sedang, dan rendah terhadap kemampuan memahami konsep.

Kata kunci: Hybrid Learning, Penguasaan Konsep, Self-Regulation

INTRODUCTION

The process of making physics education teachers able to compete both in emergency conditions and conditions that are expected in the modern era requires good preparation, one of which is a learning model (Guo, Saab, Post, & Admiraal, 2020; Putra, Junaid, & Sulman, 2021; Zb, Novalian, Ananda, Habibi, & Sulman, 2021). Learning models amid a pandemic is still lacking in terms of the references used. An appropriate and effective learning model is needed in the lecture process; the right and effective learning model is

very important to improve the ability of prospective teachers who are prepared in today's modern era and are expected to be able to provide various learning solutions in multiple conditions, especially amid a pandemic (Zb, Novalian, Rozal, Sulman, & Habibi, 2021). In preparing a physics teacher, one of the essential abilities is a mastery of concepts (Smith, Wittmann, & Carter, 2014; Sutopo, 2016; Torres, 2011), where this is the physics ability needed to solve various problems in everyday life. Day and to understand more profound physics concepts (Meiliani, Tanti, & Sulman, 2021; Sulman, Sutopo, & Kusairi, 2021). The best ability to understand fundamental physics concepts will give an educator confidence to be constantly encouraged to improve their quality and abilities according to and in line with the times when the knowledge that is emphasized is the knowledge that can be used as a tool to know apply a concept. Basic physics concepts in solving problems in everyday life, whether in applying physics formulations or using these formulas to solve problems in the environment (Sulman, Tanti, Habibi, & Zb, 2021; Zb, Setiawan, & Sulman, 2020). The essential ability of physics will be maximized in terms of how well the students master the concepts. A good understanding of concepts can help not only prospective physics teacher students to be able to solve physics problems in books but also be able to solve phenomena that occur in life with existing formulations, especially on Newton's second law material, where students only assume that Newton's second law of problem-solving is only used for calculation problems with the formula F = m.a. They do not know that F dp/dt is not Newton's second law, this indicates that students' mastery of concepts is still low (Meiliani et al., 2021). This is reinforced by the fact that in the field, the results of the initial test of the ability to master physics concepts carried out in the classroom still show that there are still many prospective physics teachers who do not have good conceptual mastery (Fidan & Tuncel, 2019; Meiliani et al., 2021; Scott & Schumayer, 2017).

The low mastery of physics concepts, especially Newton's second law, is estimated to be due to several factors, one of which is the initial ability of students who have been firmly planted without further checking for truth, and all formulating concepts are carried out using memorization techniques only in the lecture process (Sulman, Tanti, et al., 2021; Sulman, Taqwa, Aminah Zb, Rafzan, & Fikri, 2020). The understanding they have is still very dependent on the formula F = ma alone, so their concept is a little stiff when they have to analyze phenomena related to Newton's second law more deeply. In other words, their abilities only rely on the formulas that were learned in school, making it difficult to develop further understanding. Or have difficulty in mastering the concept of Newton's second law further. Therefore, lecturers must provide an appropriate alternative so that they can improve the ability of prospective physics education teachers to understand the concept of Newton's second law well, namely by using a learning model that is truly able to work optimally in various conditions both online and offline. Offline and encourage candidates to analyze or study Newton II's legal materials more deeply. The low Mastery of Newton's Law II concepts can be influenced by various factors, for example, the ability of educators, students, and learning models. This is a sign that one of the solutions is the use of appropriate learning models (Rozal, Ananda, Zb, Fauziddin, & Sulman, 2021; Zb, Novalian, Ananda, et al., 2021; Zb, Novalian, Rozal, et al., 2021). The learning model must have a wider impact on student learning outcomes, especially on Newton's second law material.

Hybrid Learning is a learning model that integrates two forms of learning, both online and offline so that it is very useful and able to be the right solution in overcoming education in both emergency and normal situations (Chang & Chang, 2014; Cremers, Wals, Wesselink, Nieveen, & Mulder, 2014; Lin, 2008; Zb, Setiawan, Rozal, & Sulman,

2021). Hybrid Learning is a learning model that integrates two forms of learning, both online and offline so that it is very useful and able to be the right solution in overcoming education in both emergency and normal situations (Helms, 2014; Wang, 2001; Zb, Setiawan, et al., 2021). Previous research explained that integrating Hybrid learning into learning could improve students' creativity and cognitive abilities (Zb, Setiawan, et al., 2021). In the lecture process, both under normal and emergency conditions, many facts show that there is ineffective learning, which also indicates the importance of implementing the Hybrid learning model as a solution for the lecture process in the future. Of course, we will not experience a learning process without preparation, and we never think about it like in the initial conditions of the pandemic.

Understanding the hybrid learning model is believed to be the best solution in learning in various conditions and in the future. In addition to learning factors from outside students that affect the low ability to master concepts, there are other factors, including the ability of prospective teachers themselves or the students themselves, namely the self-regulation of students (Michalsky, 2020; Müller & Seufert, 2018; Watson-Brown, Scott-Parker, & Senserrick, 2019). Self-regulation is a person's ability to direct thoughts, feelings and desires, and actions to achieve goals (Blau, Shamir-Inbal, & Avdiel, 2020; Lavasani, Mirhosseini, & Hejazi, 2011; Liaw & Huang, 2013; Tanti et al., 2018; Zheng et al., 2021), in this research, the focus is on mastery of concepts and learning outcomes on the material of Newton's second law to the maximum. Students have abilities that can affect student learning activities, including background knowledge, level of knowledge, learning styles, thinking patterns, cognitive abilities, learning motivation (Sulman, 2019), and so on. Associated with different self-regulation can be a factor that can cause differences in the ability to analyze and solve problems between students in understanding basic physical concepts, especially in Newton's second law material. With the existence of self-regulation, the lecture process is not allowed to limit a student only in terms of providing material from student lecturers, but students are required to have the courage and effort to be able to regulate themselves in understanding a problem (Rozal et al., 2021; Watson-Brown et al., 2019; Zb, Novalian, Ananda, et al., 2021). Previous research related to Hybrid Learning has shown that Hybrid Learning makes students able to have creativity; Hybrid Learning has many potential benefits for individuals and nations in lectures in various conditions; Hybrid Learning can increase the achievement of creative thinking abilities. There is a difference between previous research and this research in that previous research focused on the Hybrid Learning model on creativity, while the novelty of this research is the Hybrid Learning model on Concept Mastery and Self Regulation. So the purpose of this study was to determine the effect of Hybrid Learning on concept mastery and self-regulation of prospective physics education teacher students on Newton's second law material.

METHOD

The research method that researchers have done in this research process uses a quantitative approach with the Quasi Experiment method. This is used because the researcher considers that there are very many variables in research that have a very important role in shaping and changing student understanding in a lecture process, so it is very difficult to control all of these variables. The research design used in this study uses a design or a form of 2x3 factorial research design. It is used with the aim of looking in more detail and focusing on the influence of each variable under review. The form of the research plan in detail can be seen in Table 1.

Table 1. Research Design

Learning Model	Self-Regulation		
	High (B1)	Medium (B2)	Low (B3)
Hybrid Learning (A1)	A1B1	A1B2	A1B3
Non-Hybrid Learning (A2)	A1B2	A2B2	A2B3

The research design that the researcher has presented above is in table 1, showing a learning process using two classes with a student population in semester VI at the physics tardis of UIN Sulthan Thaha Saifuddin Jambi. The class taking process uses a simple random sampling technique without replacement (without a return process) with 15 students in the class with the Hybrid learning model and 18 in the Non-Hybrid Learning model class. The non-hybrid learning model class uses the learning process carried out in the previous learning, namely full offline, while hybrid learning uses two types of lectures, namely synchronous and asynchronous. In the research that has been carried out, the data collection technique uses an essay test of mastery of Newton's second law of law material concepts. While the self-regulation questionnaire with indicators that are not dependent on others, have self-confidence, behave in a disciplined manner, have a sense of responsibility, behave on their own initiative and exercise self-control. The data analysis techniques that have been used include the normality test and homogeneity test, and hypothesis testing using two-way ANOVA with the help of SPSS Software 17.0.

RESULT AND DISCUSSION

Results

The research process that has been carried out shows several facts, which are based on the objectives of the researcher; wherein this study, the research has succeeded in revealing how the influence of the Hybrid Learning learning model on the ability to master concepts and self-regulation of physic education students in Newton's Law II material. The following are the results of the statistical normality test using the Kolmogorov-Smirnov test with a significance level of 0.05.

Table 2. Normality Test of Concept Mastery Ability Data

No	Learning_Model	Kolmogrov-Smirnov[a]		
		Statistic	df	Sig.
Value	Non Hybrid Learning	.138	18	.072
	Hybrid Learning	.127	15	.193

No	Self-Regulation	Kolmogrov-Smirnov[a]		
		Statistic	df	Sig.
Value	High	.187	12	.064
	Medium	.163	9	.053
	Low	.154	12	.024

Based on Table 2 above, it is very clear that it can be seen that in each group, the learning model carried out during lectures and Self-Regulation has a significance value of more than 0.05. This clearly indicates that the research group has been carried outcomes from a normally distributed population. The researcher then continued with the

homogeneity test. The homogeneity test was carried out on the mastery data of students' basic physics concepts on Newton's second law of material concepts. The test used is the Levene statistic test, where the results can be seen in Table 3.

Table 3. Test of Homogeneity of Variance

F	df1	Df2	Sig.
1.852	5	27	.153
Levene's Test of Equality of Error Variances[a]			
Dependet Variabel : Value			

Based on Table 3 above, it can be seen that there is a significant value of 0.153 > 0.05. This clearly indicates that in this study, the existing samples have similarities or inhomogeneous terms. That is, the population in the research conducted comes from populations that have the same variance. The results of the analysis of the normality and homogeneity test as a prerequisite test so that it can be continued with the 2-way Anova test. Hypothesis testing in this study used a two-way analysis of variance with unequal cells. The data for the analysis of variance in 2 unequal paths can be seen in Table 4.

Table. 4 Analysis of Two Unequal Ways of Variance

Source	Type II Sum Squares	f	Mean Square	f	sig.
Corrected Model	2025.347[a]	5	405.0694	13.683	.000
Intercept	272342.164	1	272342.164	0314.780	.000
Learning_Model	138.257	1	138.257	3.495	.026
Self_Regulation	1746.042	2	873.021	23.562	.000
Learning_Model * Self_Regulation	48.324	2	24.162	2.158	.023
Error	1559.412	27	57.756		
Total	2787342.000	33			
Corrected Total	2831.137	32			

Based on table 4, the facts clearly show that the learning model is 0.026 < 0.05, which means that there is an influence between the non-Hybrid Learning and Hybrid Learning models on students' conceptual mastery in Newton's second law material. The analysis also shows that it clearly shows that the ability of students to understand concepts in Newton's second law taught through the Hybrid Learning learning model is better than non-Hybrid Learning.

Discussion

In the research process that has been carried out, various facts support each other in the theoretical study that has been proposed, where it is found that the student's concept mastery ability is better by using the Hybrid Learning learning model compared to non-Hybrid Learning, it is clear that the lecture process on the material Newton's second law whose Learning uses the Hybrid Learning learning model can be a good facilitator in the lecture process, especially in various conditions, besides that in the lecture process not only relying on the conventional lecture process but also using technology, which requires students to be able to at the same time hone technology skills so that students are not left behind in the era of the industrial revolution 4.0 (Zb, Novalian, Ananda, et al., 2021; Zb, Setiawan, et al., 2021) which can indirectly improve students' digital literacy

skills. The learning process using a hybrid learning model can be the best and most appropriate direction for the flow of lectures during a pandemic and in future conditions. The lecture process must become a facility in various conditions so that educators are no longer overwhelmed due to the lack of habituation of educators and students in conducting lectures amid a pandemic. The lecture process must be maintained as the front line in improving the quality of human resources, especially physics education. This is an early warning that we should focus and concentrate on learning models that can be used in all conditions, such as the hybrid learning model, so that mastery of the concept of material, in this case, Newton's Second Law, can still be maximally achieved in various conditions.

Increasing students' mastery of concepts by using a hybrid learning model can improve lecturer control in learning in emergencies and be able to connect online and offline lectures well in various conditions (James & Busher, 2013; Yu & Xi, 2009), , the lecture process, especially in teaching and learning. In emergency conditions such as a pandemic, sensitivity is needed in the lecture process, especially in Newton's II law material; the lecture process carried out must be able to make students more active and independent in providing various answers, as is provided by the Hybrid Learning model, which is capable of being a facility the best in the lecture process amid a pandemic, especially in maximizing the learning process in the form of mastering Newton's second law concepts. The advantages of the hybrid learning model based on the data that have been presented are also indicated that the hybrid learning model can help students directly and replace face-to-face learning on a virtual basis to reduce weaknesses. Lecturers can help students directly (Lestari et al., 2021), so that the new experiences that students get in lectures amid a pandemic will be positive due to changes in learning that can improve students' understanding and motivation to learn (Lin, 2008; Zb, Novalian, Ananda, et al., 2021) and are very different from the lecture process without using the Hybrid learning model.

The lecture process uses a non-Hybrid learning model in the lecture process, especially amid a pandemic or in unusual conditions, which is believed to convey information quickly. However, this model is more likely to make students passive and develop their reasoning less (Sulman, 2019), due to lack of accuracy. The lecture process is carried out so that the lecture process feels very passive, and the knowledge transfer process is complicated to do; this is exacerbated by the factor of lecturer control over students during lectures amid a pandemic that is very lacking so that the desire and motivation of students to understand further learning is slightly neglected (Goodhew, Robertson, Heron, & Scherr, 2019; Stathopoulou & Vosniadou, 2007). It is suspected that the results obtained by learning with the non-Hybrid Learning model have shortcomings in maximizing students' abilities amid extraordinary conditions such as a pandemic so that the quality of student analysis is not pushed to better understand the importance of a material to be understood and taught, especially with a more comprehensive analysis of questions. that applies to Newton's second law which requires a good mastery of concepts will be a significant obstacle for students in providing an answer or conclusion to the problem. Lack of student ability. The lack of a precise learning model becomes an obstacle in the maximal lecture process. Finally, the learning process tends to be only carried out as a means of carrying out teaching and learning obligations, which will not show interest and confidence in students to understand the importance of Newton's second law material for teaching and learning. Can be learned, understood, and applied. This is what causes the ability to understand Newton's second law of law material concepts with the Hybrid Learning model to be better than the non-

Hybrid Learning model, especially in non-ideal conditions where the lecture process is carried out as usual or in various conditions and becomes the best solution in the lecture process in the future.

In the research process carried out, several facts regarding Self Regulation are also obtained, which are considered to have a vital role in increasing student understanding and self-regulation in the learning process (Bondarenko, 2017; Tanti et al., 2018). In the self-regulation capability, it can be seen that statistical data shows facts with a value of $0.000 < 0.05$. This indicates a difference between each category of students' self-regulation ability in understanding Newton's second law and the ability of students to master concepts in understanding and solving problems in Newton's second law. Self-regulation can positively impact individuals to achieve a better and maximum goal (Michalsky, 2020; Xiao & Yang, 2019), and this can be reflected in the learning outcomes and understanding of student concepts. The ability to master students' concepts in Newton's Law II material clearly shows that students who have high self-regulation abilities are better than students who have moderate and low self-regulation abilities, and students who have moderate self-regulation abilities are better at mastering concepts. Good compared to students who have low self-regulation ability. Students' self-regulation ability is a significant effort for students who emerge from themselves to understand Newton's II law material better more optimally and become a driving force for students in building mastery of physics concepts. When analyzed further by using a 2x3 variance analysis, as the researcher explained, it is found that the statistics on the Hybrid Learning and Self-regulation learning model are $0.023 < 0.05$, meaning that there is a difference between the Hybrid Learning learning model and the student's self-regulation ability on students' conceptual understanding abilities. This provides an overview and the fact that Self Regulation provides maximum support in increasing student concept mastery. Of course, it cannot be separated from the appropriate learning model provided during the lecture process, so from the facts obtained by researchers in this study, they can explain and guarantee that the increase in student's conceptual understanding skills is in line with the students' self-regulation, especially on Newton's Second Law.

CONCLUSION

Based on some of the facts that have been described above, both based on data analysis and theoretical studies that support the research that has been presented, an important conclusion can be drawn, namely that there is an influence on the ability to master the concepts of students who use the Hybrid Learning model with non-Hybrid Learning. Hybrid Learning can provide learning outcomes, especially Newton's Law II material which is better than understanding concepts of students who use the Non-Hybrid learning model. Then another critical fact in this study shows how Self Regulation with Mastery of Student Concepts on Newton's Law II material is in line and mutually reinforcing. The ability to Mastery concepts in high Newton's Law II material is better than students with moderate and low self-regulation categories. Ability The students' concept mastery ability with moderate concept mastery ability is better than students with low self-regulation. Overall, from the facts that the researchers found in the field and also based on the statistical analysis that has been done, there is an influence between the Hybrid learning model and the students' self-regulation abilities with high, medium, and low categories on the ability to understand students' concepts in Newton's II law material. Researchers consider this research still has many shortcomings. I hope other researchers can analyze other variables that can affect learning outcomes, especially Newton's second

law, as a learning solution in various conditions and in the future so that the resulting research results are better and maximal.

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