

The Impact of Self-Directed Learning Model with Articulate Storyline 3 on Vocational Students' Motivation and Physics Achievement.

Tri Choirul Nur Amalia^{1*}, Subiki², Firdha Kusuma Ayu Anggraeni³

¹ Program Studi Pendidikan Fisika, Universitas Jember, Jawa Timur, Indonesia; trichoirlnuramalia@gmail.com

² Program Studi Pendidikan Fisika, Universitas Jember, Jawa Timur, Indonesia; subiki.fkip@unej.ac.id

³ Program Studi Pendidikan Fisika, Universitas Jember, Jawa Timur, Indonesia; firdhakusuma@unej.ac.id

* Corresponding Author : Tri Choirul Nur Amalia

Abstract: This research investigated how using Articulate Storyline 3 within a Self-Directed Learning (SDL) model affected vocational students' motivation and physics learning achievements. The study employed a true experimental design, specifically a Post-test Only Control Group Design and was carried out at SMK Negeri 2 Jember. Sample determination is done by conducting a homogeneity test, then randomly selected for the control class and the experimental class through a lottery. Data was collected using observation, interview, questionnaire, test and documentation methods. The data analysis technique used was normality test and T test with the help of IBM SPSS 25 software. Questionnaire results indicated that students in the experimental group, who used the Self-Directed Learning model with Articulate Storyline 3, showed higher average learning motivation compared to the control group. The results of data analysis of student learning motivation with the Independent Sample T-test test obtained a significance value of $0.008 \leq 0.05$, which means H_0 is rejected and H_a is accepted. The post-test results revealed that students in the experimental group, who learned physics using the Self-Directed Learning model with Articulate Storyline 3, achieved higher average scores than those in the control group. The results of data analysis of student physics learning outcomes tested with the Mann-Whitney U-test get a significance value of $0.004 \leq 0.05$ which means H_0 is rejected and H_a is accepted. So it can be concluded that there is a significant effect of the application of the SDL model accompanied by Articulate Storyline 3 media on student motivation and physics learning outcomes.

Keywords: Articulate Storyline 3; Learning Motivation; Learning Outcomes; Self Directed Learning

1. Introduction

Physics is often one of the subjects that students dislike the most because it is considered difficult to understand. The root cause of students' difficulty in understanding physics lies in their low motivation to learn (Etikamurni *et al.*, 2023). Learning motivation plays an important role in determining students' academic achievement (Imran *et al.*, 2024). Student motivation to learn will be directly proportional to the achievement of learning outcomes. When a student has a weak learning motivation, this will be reflected in their unsatisfactory academic achievement. Conversely, students who have a strong drive to learn tend to be able to achieve better learning outcomes. Therefore, teachers must make optimal efforts to encourage students' learning motivation, so that the learning outcomes obtained are also optimal.

The results of interviews conducted with IPAS subject teachers at one of the state vocational schools in Jember stated that IPAS learning outcomes related to physics subject matter were still less than 40% of students who met the minimum standards. This situation is because only a small proportion of students have high motivation to find out about what they are learning, while most need encouragement from the teacher. In addition, according to the results of research from Sanjaya *et al.*, (2023) stated that learning models that are less varied and less optimal use of media can affect low levels of motivation and student academic achievement.

Based on the problems that occur related to physics learning in IPAS subjects, a learning model is needed that can foster students' intrinsic motivation, so that students are more enthusiastic during learning. The Self Directed Learning (SDL) model is a learning process where a person takes an active role in controlling and directing their learning. However, the SDL model has the disadvantage that not all students have high motivation to learn independently (Leuwol *et al.*, 2023). These weaknesses can be minimized by integrating the application of the SDL model and learning media during the learning process. Innovative

Received: January 30th 2025;

Revised: February 20th 2025;

Accepted: March 08th 2025;

Online Available: March 10th 2025

Curr. Ver.: March 10th 2025



Copyright: © 2025 by the authors.

Submitted for possible open

access publication under the

terms and conditions of the

Creative Commons Attribution

(CC BY SA) license

(<https://creativecommons.org/licenses/by-sa/4.0/>)

learning media can trigger thinking skills and motivate students to be actively involved in learning (Irawan *et al.*, 2024). The application of interactive media is one type of learning media that has the potential to support students in understanding learning materials. Articulate Storyline 3 is one of the software that is widely used to create interactive learning in education. Articulate Storyline 3 is an easy-to-use software for creating learning media, presentations, and communications. This software has a similar appearance to Microsoft Power Point but is more creative (Ajmadewi *et al.*, 2024)

Previous research conducted by Wahyudi *et al.*, (2024) which examines the correlation of the SDL model to the learning motivation of vocational students shows that the SDL model has a significant effect on learning motivation. Another study has also been conducted by Sarahono *et al.*, (2024) which provides validation that the SDL model can positively affect physics learning outcomes. Rosmilawati *et al.*, (2022) demonstrated that the Self-Directed Learning (SDL) model effectively boosted students' learning motivation. In addition, research results from Sidmewa *et al.*, (2021) show that the SDL model has a strong effect on students' economic learning achievement. Research conducted by Khotimah (2022) showed that student learning achievement increased after the SDL model learning process was implemented. Meanwhile, Khairunnisa *et al.*, (2024) found that the use of Articulate Storyline 3 media proved to have a significant positive impact on the level of student learning motivation when studying material about the coordination system in the human body. Consistent with Listiani *et al.*, (2024) findings on high school students, Fitrawan *et al.*, (2024) also observed a rise in student learning achievement when Articulate Storyline 3 was incorporated into the learning process.

Based on previous studies, researchers assume that the application of the SDL model and Articulate Storyline 3 media can encourage student learning motivation so that optimal learning outcomes are obtained. Research on learning with the SDL model supported by Articulate Storyline 3 media on learning motivation and physics learning outcomes is still limited. Based on the background discussed, it is crucial to conduct further studies to determine the influence of the SDL model, supported by Articulate Storyline 3 media, on student motivation and learning outcomes. Thus, the researcher chose the title “The Effect of Self-Directed Learning (SDL) Model Assisted by Articulate Storyline 3 Media on Motivation and Physics Learning Outcomes of Vocational Students”.

2. Literature Review

2.1. Learning Physics in Vocational Schools

Physics learning is a scientific process consisting of three main components: concepts, principles, and theories applied through various scientific processes (Sari & Apridiana, 2021). physics learning does not only focus on memorizing formulas but students are required to actively participate in understanding various concepts and being able to see the relationship between one concept and other physics concepts (Subiki *et al.*, 2024). Vocational students are expected to use the physics concepts they learn to apply them in technological fields, which is the foundation of their vocational abilities (Badaun *et al.*, 2020).

2.2 Model Self Directed Learning

The SDL model was developed and popularized Knowles (1975), who stated that in SDL students take their learning initiatives, including determining learning needs, setting goals, selecting learning resources and strategies, and evaluating learning outcomes, all of which are done alone or in collaboration with others. Students must be responsible for their learning activities, know the learning objectives, identify their knowledge deficiencies, and utilize appropriate resources to achieve learning objectives (Bosch & Goede, 2019). So, it can be simplified that the Self Directed Learning (SDL) model is a model used in learning so that students can take the initiative to analyze, select, plan, and evaluate their own learning needs and results. Description of the stages of the SDL Model according to Huda (2013) presented in Table 1 below:

Table 1. Stages of the Self Directed Learning (SDL) Model

Steps	Learning Steps
Phase 1: <i>Planning</i>	The teacher asks the students to set independent learning objectives and plan the learning activities.

(Huda, 2013)

Phase 2: <i>Implementing</i>	The teacher allows the students to choose the topics they want to study according to the learning objectives and take notes on the important things in the material.
Phase 3: <i>Monitoring</i>	The teacher supervises students while doing the learning tasks as well as other activities related to the main learning task.
Phase 4: <i>Evaluating</i>	The teacher gives questions/quizzes to determine the extent of students' understanding and asks questions to students about the process of completing the task.

2.3 Media Articulate Storyline 3

Learning media is a device used to facilitate the learning process, with the aim that the teaching material delivered by the teacher will be better understood by students so that learning objectives can be achieved effectively (Kustandi & Darmawan, 2020). One type of learning media is interactive media. The application of interactive educational media such as video content and animation will not only facilitate students in understanding the material but will also create a pleasant learning environment. Therefore, teachers should utilize interactive learning media during teaching and learning activities to improve quality and positive impact (Fitrawan et al., 2024). Interactive media that is currently popular in the world of education is Articulate Storyline 3, as Authoring Tools software that plays a role in creating interactive learning content by combining various digital elements including text, visuals, graphics, audio, animation, and video. The final product is an HTML-based learning media or application that is easily distributed (Norsidi & Suwarno, 2024).

2.4 Learning Motivation

All forms of psychological encouragement that arise from within students and can drive the spirit of learning to achieve certain goals are referred to as learning motivation (Fu'adah, 2022). Student learning motivation according to Saptadi et al., (2023) is influenced by several factors including the following: (1) A conducive learning atmosphere has the potential to encourage the growth of a higher learning spirit (2) Learning methods that are interesting, interactive, and relevant to everyday life can increase student learning motivation, (3) A sense of independence in learning, (4) Clear learning goals can encourage someone to be motivated in learning, (5) Awards such as praise and recognition can increase student learning motivation because they feel valued, (6) Students' interest and confidence in learning material can encourage learning and (7) Previous experiences that have been experienced by students, be it positive or negative experiences, can affect their learning motivation. Learning motivation, according to Uno (2006) is shown by: the drive to succeed, learning necessities, future expectations, the role of rewards, enjoyable learning experiences, and a positive learning climate.

2.5 Learning Outcomes

Learning outcomes are the achievements of a person after going through and doing the learning process (Nasrah & Muafiah, 2020). According to Damayanti (2021), student learning outcomes are determined by two main aspects, namely aspects that come from within the students themselves and aspects that come from the surrounding environment. Learning outcomes are commonly divided into three categories: cognitive, which involves thinking and knowledge; affective, which deals with feelings and values; and psychomotor, which concerns physical skills (Yeni et al., 2022). This study focuses on the cognitive domain of learning outcomes by applying Anderson & Krathwohl, (2015) theory as the benchmark. The cognitive process used is the C2 cognitive category with a proportion of 30%, 40% for C3 and C4 cognitive category questions, and 30% for C5 and C6 cognitive category questions (Cressa & Mukhlis, 2023)

3. Proposed Method

This research is included in quantitative research, the research methodology applied to this study is the experimental method through true experimental design which includes a post-test-only control group design. The first stage of this research includes determining the population, as the population in this study is class X students at SMKN 2 Jember. Then conduct a homogeneity test, after the population proves to be homogeneous, the sample determination is carried out into control and experimental classes with random sampling techniques. The next stage, delivering energy material and its changes to the two sample classes. The experimental class is treated with the application of the Self Directed Learning (SDL) model assisted by Articulate Storyline 3 media, while the control class is not given

special treatment, but still applies the learning model commonly used by teachers at school. Then, post-test sheets to measure learning outcomes, and questionnaire sheets for the learning motivation of both sample classes. For more details, the stages in this study can be seen in Figure 1 below:

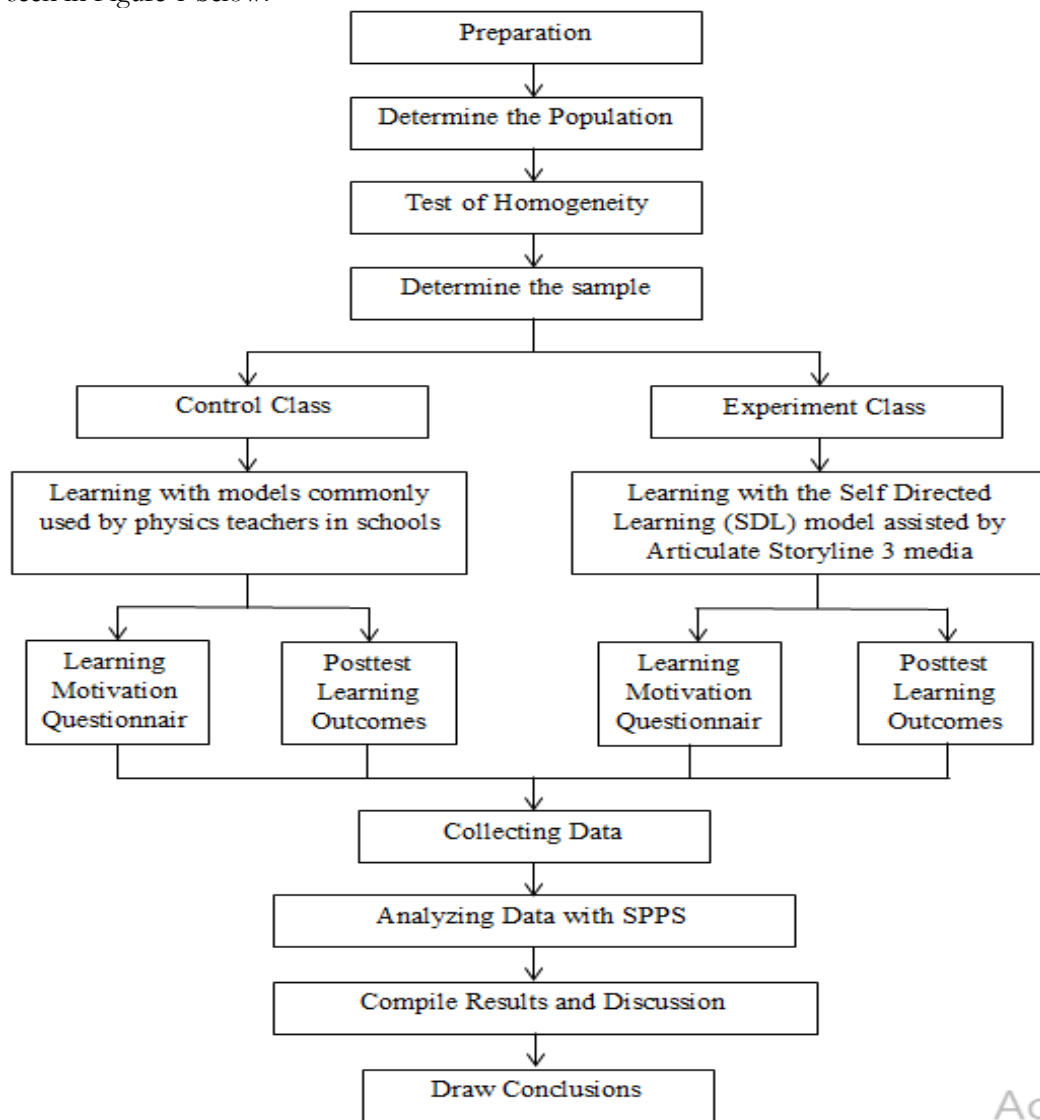


Figure 1. Stages of Research

The data in this study were collected using several data collection techniques, namely: (1) Observation, to see the effect of this model on motivation and physics learning outcomes of vocational students. The instrument used is an observation sheet, which serves to assess the implementation of learning with the Self Directed Learning (SDL) model, assisted by Articulate Storyline 3 media; (2) Questionnaire, which is closed, meaning that data collection is done by submitting statements in writing, with answers already provided. Thus, students only choose one of them by giving a check mark. This questionnaire was conducted to collect data on student learning motivation; (3) Interviews aim to obtain supporting information. The interviews conducted were free interviews which were carried out spontaneously according to the situation and circumstances when conducting the interview. This interview focuses on collecting information about the application of learning models and assessment systems by physics teachers in teaching and learning activities, obstacles faced by students during physics learning; (4) Test, which is used as an evaluation tool in this study is a post-test. The instrument used was a multiple-choice question sheet with a total of 10 questions, to measure student learning outcomes. The test questions were distributed to both sample classes. Then, it was evaluated based on the predetermined score; (5) Documentation, used as a means of collecting information used to strengthen the data obtained through other data collection techniques such as observation, interviews, and tests to make it more reliable. In

this study, documentation was used in learning activities, the values of the research population, and the values of the samples used in the assessment.

After the learning motivation questionnaire data and post-test to measure learning outcomes were obtained, the data were analyzed by testing normality through the Kolmogorov-Smirnov technique. Data analysis and hypothesis testing were executed in SPSS Version 25, where the Independent Samples T-test was used for normal data, and the Mann-Whitney U test for non-normal data.

4. Results and Discussion

This study was conducted to examine the effect of the SDL model accompanied by Articulate Storyline 3 media on the physics learning motivation of vocational students. Learning motivation in this study was measured by an instrument in the form of a questionnaire consisting of 24 statements tailored to learning motivation indicators. This study applies the measurement parameters of student learning motivation referring to the indicators formulated by Uno (2006), these factors are: a striving for success, internal motivation and needs related to learning, future expectations, the perceived worth of learning, interesting learning tasks, and a favorable learning setting.

Both the experimental and control groups completed a questionnaire to provide data regarding their motivation in physics learning. The questionnaire was given after the implementation of learning with the SDL model assisted by Articulate Storyline 3 media in the experimental class and learning with the model usually applied at school in the control class. The effect of the SDL model, supported by Articulate Storyline 3, on vocational students' learning motivation regarding energy and its changes was examined using a 24-question questionnaire based on motivation indicators. Data on students' physics learning motivation can be seen in Table 1 below:

Table 2. Data on students' physics learning motivation

	Control Class	Experiment Class
Total number of students	36	36
Lowest Score	56	58
Highest Score	88	93
Average	70	75

Based on Table 2, the results obtained are in the control class consisting of 36 students with the lowest learning motivation value of 56 and the highest learning motivation value of 88, while for the experimental class consisting of 36 students with the lowest learning motivation value of 58 and the highest learning motivation value of 93. In addition, the average value of each class was obtained. In accordance with Table 1, the average motivation score was 70 in the control class and the average motivation score was 75 in the experimental class. According to the data in Table 1, it can be concluded that the mean value obtained in the control class is lower than the mean value obtained in the experimental class. Figure 1 provides a further overview of the mean analysis of learning motivation scores for each indicator:

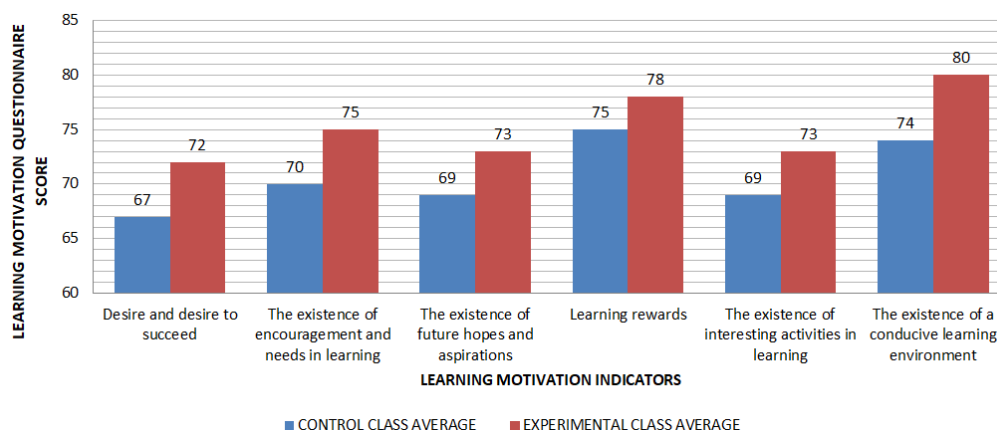


Figure 2. Graph of average student learning motivation on each indicator

Based on Figure 2, the control group's average physics learning motivation scores were 67, 70, 69, 75, 69, and 74, while the experimental group's scores were 72, 75, 73, 78, 73, and 80, indicating a lower mean motivation in the control group. Then, the effect of the

application of the SDL model accompanied by Articulate Storyline 3 media was analyzed using SPSS 25 software. The student learning motivation questionnaire data obtained was tested for normality through the K-S test assisted by IBM SPSS Version 25 software. The normality test was conducted to evaluate the distribution of student learning motivation questionnaire data, whether it had a normal data distribution or not. Normality testing with the K-S test obtained the following results in Table 3:

Table 3. Normality Test Result
 One-Sample Kolmogorov-Smirnov Test

		Experimental Class Learning Motivation	Learning Motivation of Control Class
N		36	36
Normal Parameters ^{a,b}	Mean	74.89	70.19
	Std. Deviation	6.641	8.014
Most Extreme Differences	Absolute	.110	.143
	Positive	.083	.143
	Negative	-.110	-.129
Test Statistic		.110	.143
Asymp. Sig. (2-tailed)		.200 ^{c,d}	.062 ^c
a. Test distribution is Normal.			
b. Calculated from data.			
c. Lilliefors Significance Correction.			
d. This is a lower bound of the true significance.			

In accordance with the K-S test results listed in Table 3 the Sig. (2-tailed) obtained by both classes, namely the control class of 0.062 and the experimental class of 0.200. Referring to the normality test criteria, data is considered normally distributed if the Sig. (2-tailed) value is greater than the 0.05 threshold. The normality distribution of learning motivation questionnaire data, which is confirmed through the normality test, allows the hypothesis to be carried out using the Independent Sample T-test method. The results of hypothesis testing with the Independent Sample T-test are based on Table 4 below:

Table 4. Independent Sample T-test Results

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Value	Equal variances assumed	2.041	.158	-2.667	70	.010	-4.639	1.740	-8.108	-1.170
	Equal variances not assumed			-2.667	67.826	.010	-4.639	1.740	-8.110	-1.168

Hypothesis testing results with Independent Sample T-test based on Table 4 Sig. value on Levene's Test for Equality of Variances is 0.158, which is higher than 0.05. This shows that the data questionnaire data on physics learning motivation is homogeneous. Sig value. (2-tailed) from the Independent Sample T-test is 0.010, which is less than 0.05. The rule for determining hypothesis acceptance was that if the significance value was less than 0.05, then the null hypothesis (H0) was rejected and the alternative hypothesis (Ha) was accepted. That is, in the data there is an average difference between the two sample classes. These findings confirm that the SDL model, when integrated with Articulate Storyline 3, has a significant influence on student motivation in learning.

Data on students' physics learning motivation through questionnaires that have been distributed to both classes obtained the results that the mean value of learning motivation between class X DPIB 1 as the experimental class is greater than class X TKR 3 as the control class, this difference is due to class X DPIB 1 which received treatment from the integration of the SDL learning model with Articulate Storyline 3 media. The difference is not enough from the mean value of motivation of the experimental class and the control class, because in the control class, the learning process is carried out with a model commonly used by physics teachers at school, namely the PBL model. The SDL model and the PBL model have the same principle, namely student-centered learning. Focusing on the student in the learning environment encourages active involvement, which helps students build their own knowledge and strengthens their learning motivation. This is because students will feel in control of their own learning. In line with Jeon & Park (2021) which states that the SDL and PBL models are learning models that emphasize active learning and the development of independent learning abilities, the PBL model with its problem-solving focus and the SDL model with student initiative in the learning process.

Through the application of the SDL model, experimental class students are given the freedom to determine learning objectives, and plan and select learning resources used according to their own wishes assisted by interactive Articulate Storyline 3 media. In line with the theory of Leuwol *et al.*, (2023) which states that the freedom given to students in learning is able to arouse and maintain student motivation. The application of the SDL model supported by Articulate Storyline 3 media also provides interesting visualizations such as animations, videos, and quizzes. So that it can make learning more fun and motivate students to continue learning. Articulate Storyline 3 media visualization can be seen at the following link <https://choirul251.itch.io/energi>. This is strengthened Fradani *et al.*, (2022) which states that the SDL model integrated with interactive visual media will make students more motivated because they are more comfortable and entertained in learning so that they are not easily bored.

Based on Figure 2 which shows the bar chart of each indicator in the control class and the experimental class, it can be seen that in the experimental class, the indicator of learning motivation with the highest average value is the indicator of a conducive learning environment, which is 80 and the lowest average value is the indicator of the desire and desire to succeed, which is 72. These results can be explained because in the SDL model, with students asked to determine and plan their learning activities, students have good learning readiness, both physically and mentally. Reinforced by the research of Irawan *et al.*, (2024) which states that when students have control over their learning, these students will be responsible for achieving the learning targets that have been set. The integration of the SDL model with Articulate Storyline 3 media can create a conducive learning environment. Articulate Storyline 3 media allows students to set their own learning pace, besides that the material can be accessed anywhere and anytime.

Based on the results of the T-test that has been done, show that there is a significant difference from the application of the SDL model accompanied by Articulate Storyline 3 to the physics learning motivation of students. This happens because, between the SDL model, Articulate Storyline 3 media and learning motivation have continuity. Through the stages of the SDL model, learning motivation in students can be encouraged, in planning students are asked to make their own learning goals and learning activity plans according to their needs. This stage will be in line with Uno (2006) motivation indicator, namely the existence of motivation and needs in learning. When students are aware of their own learning needs, of course, this can move the student to start the learning process. The self-determination theory Ryan & Deci (2017) states that students' intrinsic motivation is influenced by the fulfillment of basic psychological needs such as autonomy, competence, and connectedness. When these needs are met, students' intrinsic motivation to learn will increase.

In addition, the planning stage is also related to indicators of future hopes and aspirations. At the planning stage, students are allowed to determine what they want to learn and how to learn a material so that their goals are achieved. That's when students will think about their wishes for the future. This supports the existing theory of Garrison (1997) which states that students' self-management skills will develop when they can manage learning goals according to their future expectations. Reinforced by research from Cheng (2023) which explains that by setting learning goals, students have a clear direction and learning goals.

At the implementing stage, motivation indicators will develop for interesting activities in learning. At this stage, students will implement the activity plan that has been prepared according to their interests. Articulate Storyline 3 media supports by providing two forms of

material presentation, namely videos and reading materials with an interactive and attractive appearance, so that students can choose the sub-material they want to learn according to their interests with more fun. In line with the theory of Schunk *et al.*, (2014), when students do learning activities that match their interests, students will be encouraged to complete tasks not because of coercion or pressure.

A conducive learning environment served as a motivation indicator during the monitoring process. At this stage, students will be divided into small groups to solve the problems in the LKPD. Through the group discussion, students will monitor their learning process and realize the supporting and inhibiting factors. Therefore, students will be encouraged to organize and manage their learning environment so that it remains or is more conducive. In line with the theory of self-regulated learning from Zimmerman (1989) which suggests that self-monitoring that occurs in group discussions helps students identify effective learning strategies. Through discussions with peers, students can compare learning strategies and find solutions to obstacles faced together to create a conducive learning environment.

In the evaluation phase, indicators of motivation included the drive for success and the presence of learning rewards. At this stage, students will evaluate their learning by taking quizzes in the Articulate Storyline 3 media. The quiz is conducted to measure the extent to which student learning objectives are achieved in this energy and change material. In the question, every correct answer will appear in appreciation words such as “good job”, “good job” and “good luck”, so that students will feel appreciated for their learning process. However, if it is wrong, the word “spirit” will appear so that students continue to try to get maximum results. The score of the quiz will appear after the quiz is completed. When students know their quiz results, they will develop awareness about their level of understanding and achievement. Therefore, students will be encouraged to maintain or improve the results achieved. Consistent with research findings by Mykytiuk *et al.*, (2022) which states that when students see an increase in their quiz scores, there will be a sense of satisfaction and achievement in students. This can strengthen students' willingness to achieve their learning goals until they succeed.

The research results found are in line with research conducted Wahyudi *et al.*, (2024) which resulted in a conclusion that the SDL model has a significant effect on learning motivation, with a significance value of 0.000. The results of other studies that are also in line with this research are studies conducted by Khairunnisa *et al.*, (2024) which obtained the results that Articulate Storyline 3 media can positively affect learning motivation, with a significance value of 0.001. The SDL model, when combined with Articulate Storyline 3, boosts learning motivation by empowering students to actively participate in their education, take initiative, and engage with interactive and stimulating content created through the software's diverse features.

The second thing that must be studied in this study is the impact of the application of the SDL model supported by Articulate Storyline 3 media on the physics learning outcomes of vocational students. The instrument used to obtain learning outcome data is a post-test question given to the control class and experimental class after learning. The post-test question consists of ten multiple-choice questions. The indicators of the questions used are by the revised Bloom taxonomy from Anderson & Krathwohl (2015), but only C2 (understand), C3 (apply), C4 (analyze), C5 (evaluate) and C6 (create). The selection of indicators is adjusted to the learning outcomes of vocational students. Table 5 below presents data on students' physics learning outcomes through the final test:

Table 5. Physics learning outcome data

	Control Class	Experiment Class
Total number of students	36	36
Lowest Score	30	50
Highest Score	90	100
Average	66,67	76,11

Table 5 reveals that both the control and experimental classes comprised 36 students. The control group's post-test scores ranged from 30 to 90, with an average of 66.67. In contrast, the experimental group's scores varied from 50 to 100, and their average was 76.11. This indicates that the experimental group, which utilized the SDL model and Articulate Storyline 3, achieved a higher mean score than the control group. Subsequently, SPSS 25 was used to analyze the impact of this learning approach, with an initial step of testing the post-

test data for normality. The Kolmogorov-Smirnov test, used to determine the normality of physics learning outcomes data, is detailed in Table 6:

Table 6. The results of the normality test of physics learning outcomes data through the K-S test

One-Sample Kolmogorov-Smirnov Test			
		Control Class	Experiment Class
	N	36	36
Normal Parameters ^{a,b}	Mean	66.67	76.11
	Std. Deviation	12.649	12.712
Most Extreme Differences	Absolute	.188	.204
	Positive	.173	.185
	Negative	-.188	-.204
Test Statistic		.188	.204
Asymp. Sig. (2-tailed)		.002 ^c	.001 ^c

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

The K-S test states that the Sig value. (2-tailed) obtained by both classes, namely the control class of 0.002 and the experimental class of 0.001. If the Sig. (2-tailed) result from a normality test is less than the 0.05 threshold, the data is deemed to be not normally distributed. Referring to the K-S test results which show that the physics learning outcomes data are not normally distributed, then hypothesis testing is carried out using the Mann-Whitney U test. The results of the Mann-Whitney U test are stated in Table 7 below:

Table 7. Mann-Whitney U test results of physics learning outcomes data

Test Statistics^a	
	Learning outcomes
Mann-Whitney U	397.000
Wilcoxon W	1063.000
Z	-2.913
Asymp. Sig. (2-tailed)	.004

a. Grouping Variable: kelas

If the Sig. (2-tailed) result from a normality test is less than the 0.05 threshold, the data is deemed to be not normally distributed. In line with the rules of hypothesis testing, a significance value of less than 0.05 indicates that H0 is rejected and Ha is accepted. That is, there is a significant difference in the average learning outcomes of the two sample classes. This indicates that there is a significant effect of the application of the SDL model assisted by Articulate Storyline 3 media on student learning outcomes. This condition can occur because Articulate Storyline 3 media is applied in learning in the SDL model in the experimental class which acts as a material provider in the form of reading or video that can be accessed flexibly and can support different learning styles so that students can learn at their own pace and ability. In addition, through Articulate Storyline 3 media, interesting learning content, sample questions, and interactive and fun quizzes are presented. Articulate Storyline 3 media is also easily accessible online or offline. The combination of Articulate Storyline 3 media provides an interesting and interactive learning experience with the SDL model that encourages student learning independence and can make students easier to master the material. In line with Piaget's theory of constructivism which argues that knowledge is built through a constructive mental process that lasts a lifetime. In the SDL model, students play an active role in building their understanding through interaction with the environment and direct experience (Adigun *et al.*, 2024). This study's results align with Susanto *et al.*, (2024) research, which found that Self-Directed Learning combined with interactive media significantly improves student learning achievement.

The SDL model can encourage students to develop through cognitive stages with the support of interesting features in Articulate Storyline 3 media making learning more enjoyable and effective to achieve good learning outcomes. Through the application of the SDL model, students can explain material sourced from reading materials and videos presented in Articulate Storyline 3 using their own words in their respective notebooks. In addition, students also apply their knowledge in solving problems in the LKPD with their groups. Although, the SDL model emphasizes independent learning, in the monitoring phase students

are expected to be able to identify their learning by discussing with the group. Thus, knowledge that they do not get can be obtained from other friends. Through the group discussion, students are also able to analyze which information is suitable to be applied to the problems in the LKPD. In the evaluating phase, through quizzes in Articulate Storyline 3 media, students are also able to evaluate the extent of their understanding independently assisted by the scoring that appears directly after they take the quiz. The research results obtained are in line with the results of research by Salahuddin *et al.*, (2022) which concluded that the SDL model makes a positive contribution to learning success with a significance level of 0.001. Another study Dani & Arief (2023) also concluded that Articulate Storyline 3 media can significantly affect physics learning outcomes, with a significance value of 0.00.

The obstacle in this study is at the implementing stage when students make a summary of the material, not a few students chat and use smartphones not for learning. The effort I made as a researcher was to require the summary to be collected at an agreed time and included in the assessment. In addition, in the implementation of learning, there are breaks, prayers, and meals between three lessons, so some students come late when entering the classroom. This can cause learning to be less effective and efficient. The solution from the researcher is to agree with students to return to class on time with a ten-minute tolerance.

5. Conclusions

The application of Self-Directed Learning (SDL) supported by Articulate Storyline 3 in learning Physics has a positive impact on both learning outcomes and student motivation. This model encourages students to learn more independently and actively, while Articulate Storyline 3 media enriches the learning experience with interesting and accessible interactive content. The interactive media in Articulate Storyline 3 allows students to access material at any time, repeat learning, and conduct interactive quizzes that strengthen memory. Physics concepts that are well understood through the SDL model and Articulate Storyline 3 media can be more easily applied in the context of everyday life.

Acknowledgments: The author would like to thank the final project supervisors, Drs. Subiki, M.Kes., M.C.E. and Firdha Kusuma Ayu Anggraeni, S.Si., M.Si., M.C.E., who have provided guidance to the author in writing this article. Furthermore, the author is grateful to the head of SMK Negeri 2 Jember who has allowed to conduct research in the school he leads.

References

- [1] Adigun, O. T., Mpofo, N., & Maphalala, M. C. (2024). Fostering self-directed learning in blended learning environments: A constructivist perspective in Higher Education. *Higher Education Quarterly*, October 2023, 1–16. <https://doi.org/10.1111/hequ.12572>
- [2] Ajmadewi, N. P. K., Rasna, I. W., & Artika, I. W. (2024). Pengembangan Media Interaktif Articulate Storyline dalam Pembelajaran Cerpen Kelas XI di SMK Negeri 1 Denpasar. *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran*, 5(1), 1117–1126. <https://doi.org/10.62775/edukasia.v5i1.978>
- [3] Anderson, L. W., & Krathwohl, D. R. (2015). Pembelajaran, Pengajaran Dan Asesmen. In *Pustaka Pelajar*.
- [4] Badaun, M., Arifin, A., & Nurussaniah. (2020). Persepsi Dan Minat Siswa Terhadap Pembelajaran Fisika Di SMK Kubu Raya. *Jurnal Pendidikan Sains Dan Aplikasinya (JPSA)*, 3(2), 56–58. <https://journal.ikipgriptk.ac.id/index.php/JPSA/index>
- [5] Bosch, C., & Goede, R. (2019). *Self-directed learning: A conceptual overview* (Vol. 1). AOSIS. <https://doi.org/10.4102/aosis.2019.bk134.01>
- [6] Cheng, X. (2023). Looking through goal theories in language learning: A review on goal setting and achievement goal theory. *Frontiers in Psychology*, 13(January), 1–7. <https://doi.org/10.3389/fpsyg.2022.1035223>
- [7] Cressa, J., & Mukhlis, M. (2023). Level Kognitif Taksonomi Bloom pada Soal Mata Pelajaran Bahasa Indonesia. *J-LELC: Journal of Language Education, Linguistics, and Culture*, 3(1), 55–62. <https://doi.org/10.25299/j-lelc.2023.12094>
- [8] Damayanti. (2021). *Penggunaan Media Audio Visual dalam Meningkatkan Hasil Belajar Akidah Akhlak*. CV. Tatakata Grafika.
- [9] Dani, A. U., & Arief, S. (2023). Pengaruh Pemanfaatan Multimedia Articulate Storyline Terhadap Hasil Belajar Fisika Peserta Didik. *JPF (Jurnal Pendidikan Fisika) Universitas Islam Negeri Alauddin Makassar*, 10(2), 216–221.

- <https://doi.org/10.24252/jpf.v10i2.19363>
- [10] Etikamurni, D. P., Istyowati, A., & Ayu, H. D. (2023). Upaya Peningkatan Motivasi Belajar Fisika Melalui Discovery Learning-Berdiferensiasi di Era Kurikulum Merdeka. *Jurnal Terapan Sains & Teknologi Rainstek*, 5(2), 180–189. ejournal.unikama.ac.id/index.php/jtst
- [11] Fitrawan, D. D., Rahayu, S. T. P., Anisa, R. L. N., Setyowati, R. R. N., & Prihatin, A. A. (2024). Penerapan Media Interaktif Articulate Storyline 3 dalam Meningkatkan Hasil Belajar pada Materi Wawasan Nusantara Kelas VIII di SMP Negeri 12 Surabaya. *Innovative: Journal Of Social Science Research*, 4(3), 10473–10486. <https://doi.org/10.31004/innovative.v4i3.11760>
- [12] Fradani, A. C., Stevani, F., & Kurniawan, A. (2022). Eksperimentasi Model Pembelajaran Self-Direct Learning dengan Media Pembelajaran Berbasis Komik Digital. *Perspektif Pendidikan Dan Keguruan*, 13(1), 80–87. [https://doi.org/10.25299/perspektif.2022.vol13\(1\).10022](https://doi.org/10.25299/perspektif.2022.vol13(1).10022)
- [13] Fu'adah, A. (2022). Pembelajaran Metode Tutor Sebaya. In *NTB: Pusat Pengembangan Pendidikan dan Penelitian Indonesia*. Pusat Pengembangan Pendidikan dan Penelitian Indonesia. <https://books.google.co.id/books?id=e3djEAAAQBAJ&printsec=frontcover#v=onepage&q&f=false>
- [14] Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult Education Quarterly*, 48(1), 18–33. <https://doi.org/10.1177/074171369704800103>
- [15] Huda, M. (2013). *Model-model Pengajaran dan Pembelajaran*. Pustaka Pelajar.
- [16] Imran, N. R., Ali, M. S., & Helmi. (2024). Hubungan Motivasi Dan Minat Dengan Hasil Belajar Fisika Peserta Didik SMANegeri 1 Makassar. *Jurnal Ilmiah Wabana Pendidikan*, 10(7), 838–852.
- [17] Irawan, A. I., Darajaatul, A. N., & Darmawan, D. (2024). Pengaruh Lingkungan Keluarga, Kemandirian Belajar, dan Media Belajar terhadap Motivasi Belajar Siswa di MI Babussalam Krian Sidoarjo. *Journal on Education*, 06(03), 16220–16233. <http://jonedu.org/index.php/joe>
- [18] Jeon, J., & Park, S. (2021). Self-Directed Learning versus Problem-Based Learning in. *Healthcare*, 9(December), 1–11.
- [19] Khairunnisa, M., Hamansah, & Rivai, T. A. O. (2024). PENGARUH MULTIMEDIA INTERAKTIF BERBASIS APLIKASI ARTICULATE STORYLINE 3 PADA MATERI SISTEM KOORDINASI MANUSIA TERHADAP MOTIVASI BELAJAR KELAS XI MIPA DI MAN 1 KOTA MAKASSAR. 5(5), 5709–5716.
- [20] Khotimah, N. (2022). Penerapan Model Pembelajaran SDL (Self Directed Learning) Untuk Meningkatkan Aktivitas Dan Hasil Belajar Siswa. *EDUCATOR: Jurnal Inovasi Tenaga Pendidik Dan Kependidikan*, 2(4), 370–383.
- [21] Knowles, M. S. (1975). *A Guide for Learners and Teachers*.
- [22] Kustandi, C., & Darmawan, D. (2020). *Pengembangan Media Pembelajaran* (Edisi Pert). Kencana.
- [23] Leuwol, F. S., Wantu, H. M., Ilham, C. I., Nduru, M. P., Sumiyati, S., Mardikawati, B., Suhendi, D., Firman, M., Anaktototy, K., Nur, M. A., & Rinaldi, F. (2023). *Top 10 Model Pembelajaran Abad 21*. Penerbit Adab.
- [24] Listiani, N. P. A., Soeprianto, H., Salsabila, N. H., & Subarinah, S. (2024). Efektivitas Media Pembelajaran Interaktif Berbasis Articulate Storyline 3 terhadap Hasil Belajar Matematika Siswa Kelas XI SMA. *Jurnal Pendidikan*, 14(3), 682–692.
- [25] Mykytiuk, S., Moroz, T., Mykytiuk, S., Moroz, M., & Dolgusheva, O. (2022). Seamless Learning Model with Enhanced Web-Quizzing in the Higher Education Setting. *International Journal of Interactive Mobile Technologies*, 16(3), 4–19. <https://doi.org/10.3991/IJIM.V16I03.27257>
- [26] Nasrah, & Muafiah, A. (2020). ANALISIS MOTIVASI BELAJAR DAN HASIL BELAJAR DARING MAHASISWA PADA MASA PANDEMIK COVID-19. *Jurnal Riset Pendidikan Dasar*, 03(2), 207–213.
- [27] Norsidi, N., & Suwarno, A. (2024). Efektivitas dan Kelemahan Pembelajaran Interaktif Berbasis Articulate Storyline 3 Pada Mata Pelajaran Geografi di Kelas XII IPS SMA Wisuda Pontianak. *Geodika: Jurnal Kajian Ilmu Dan Pendidikan Geografi*, 8(1), 32–40. <https://doi.org/10.29408/geodika.v8i1.25728>
- [28] Rosmilawati, I., Hanafi, S., & Wijayanti, E. R. (2022). PENERAPAN MODEL SELF-DIRECTED LEARNING

- UNTUK MENINGKATKAN MOTIVASI BELAJAR SISWA PAKET B DI WINDSOR HOMESCHOOLING JAKARTA BARAT. *Jurnal Eksistensi Pendidikan Luar Sekolah*, 7(1), 58–66.
- [29] Ryan, R. M., & Deci, E. L. (2017). Self-Determination Theory. In *The Wiley Encyclopedia of Personality and Individual Differences*. <https://doi.org/10.1002/9781118970843.ch61>
- [30] Salahuddin, S., Sastradika, D., Purnama, B. Y., Pransiska, S., & Ramadani, S. P. (2022). Jurnal Phi penerapan pembelajaran Self-Directed Learning. *Jurnal Phi*, 8(1), 35–40.
- [31] Sanjaya, H., Misdalina, & Suryani, I. (2023). Analisis Faktor-Faktor Penyebab Rendahnya Motivasi Belajar Siswa Pada Mata Pelajaran IPS Kelas IV SD Negeri 1 Sunggutan. *Journal on Education*, 05(03), 7674–7682.
- [32] Saptadi, N. T. S., Subroto, D. E., Nurlely, L., Latif, A., Loilatu, S. H., Rizqiyani, R., Evenddy, A. A., Wibowo, M. A., Desiyanto, J., Irfan, Malahati, F., Romadhon, K., Bariqoh, A., Ramayanti, A., & Ananingsih, V. K. (2023). *Psikologi Pembelajaran*. PT SADA KURNIA PUSTAKA.
- [33] Sarahono, F. R., Lase, A., Laoli, B., & Laoli, E. S. (2024). Penerapan Model Pembelajaran Self Directed Learning (SDL) untuk Meningkatkan Hasil Belajar Siswa. *Jurnal Penelitian, Pendidikan Dan Pengajaran (JPPP)*, 5(2), 218–224. <https://doi.org/10.51878/educator.v2i4.1934>
- [34] Sari, P., & Apridiana, N. (2021). Analisis Respon dan Ketertarikan Peserta Didik Terhadap Pelaksanaan Pembelajaran Fisika Berbasis Environmental Learning di SMA. *PENDIPA Journal of Science Education*, 5(3), 337–344.
- [35] Schunk, D., Judith, M., & Pintrich, P. (2014). Pearson New International Edition. In *British Library Cataloguing-in-Publication Data*.
- [36] Sidmewa, A. A. N., Susanti, Y., & Putra, R. A. (2021). Pengaruh Model Self Directed Learning Terhadap Hasil Belajar Siswa Pada Mata Pelajaran Ekonomi. *J-KIP (Jurnal Keguruan Dan Ilmu Pendidikan)*, 2(3), 197. <https://doi.org/10.25157/j-kip.v2i3.6228>
- [37] Subiki, Bahari, F., & Nuraini, L. (2024). The Effect of Guided Inquiry Accompanied by Virtual Laboratory on Students' Physics Learning Outcomes and Motivation. *JIPF (Jurnal Ilmu Pendidikan Fisika)*, 9(1), 114. <https://doi.org/10.26737/jipf.v9i1.4163>
- [38] Susanto, H., Setiawan, D., Mahanal, S., Firdaus, Z., & Tsany Kusmayadi, C. (2024). Development and evaluation of e-comic nervous system app to enhance self-directed student learning. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 10(1), 143–153. <https://doi.org/10.22219/jpbi.v10i1.31451>
- [39] Uno, H. B. (2006). *TEORI MOTIVASI DAN PENGUKURANNYA*. PT Bumi Aksara.
- [40] Wahyudi, R., Anori, S., Hidayat, H., & Irfan, D. (2024). Analisis Korelasional Model Self Directed Learning terhadap Motivasi dan Kreativitas Belajar pada Mata Pelajaran Elektronika di SMK Negeri 1 Batipuh. *Journal of Hypermedia & Technology-Enhanced Learning (J-HyTEL)*, 2(3), 229–244.
- [41] Yeni, D. F., Putri, S. L., & Setiawati, M. (2022). Pengaruh Motivasi Belajar Siswa Terhadap Hasil Belajar Siswa Smp N 1 X Koto Diatas. *PROMOSI (Jurnal Pendidikan Ekonomi)*, 10(2), 133–140. <https://doi.org/10.24127/pro.v10i2.6591>
- [42] Zimmerman, B. J. (1989). *Models of Self-Regulated Learning and Academic Achievement*. https://doi.org/10.1007/978-1-4612-3618-4_1