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Evaluation of Student Learning Outcomes through the 4.0 Demonstration Learning Model in Class X Students in Digital Communication Simulation

Mesterjon[1*], Dwi Rulismi[2] & Prof. Sudarwan Danim[3]
[1,2]Dehasen University & [3]Bengkulu University

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ABSTRACT **Original Research Article**

This research aims to assess the effectiveness of the demonstration learning model in enhancing student learning outcomes. The study employs a quantitative research approach, utilizing observation, interviews, documentation, and questionnaires as data collection methods. Data were gathered through observation sheets. The study population consisted of digital communication simulation teachers and Grade X students from the TKJ department at a Vocational High School (SMK) in Bengkulu City. A total sampling technique was applied, meaning the entire population was selected as the research sample, which included one teacher and 11 students. The data analysis was carried out using descriptive quantitative methods with the help of a t-test. Following the application of the demonstration method (post-test), the average score (mean) of the questionnaire instrument was 33.27, with a standard deviation of 2.195, according to the t-test results. Meanwhile, the average score for the multiple-choice test (post-test) reached 7.73. These findings indicate that the demonstration learning model had a positive impact on improving the learning outcomes of Grade X students at SMK Bengkulu.

Keywords: Effectiveness, Demonstration Method, Student Learning Outcomes.

**Corresponding author: Mesterjon Dehasen University*

Introduction

The rapid advancement of Industry 4.0 technology has significantly influenced various sectors, including education. One of its primary roles is serving as a valuable tool in the teaching and learning process. As highlighted by Mesterjon & Kom (2021) in their book "Theory and Management Concepts of Learning Systems 4.0", the integration of Technology 4.0 into education particularly in instructional practices enhances the creativity and competitiveness of both teachers and students. This technological integration enables educators to develop innovative learning models that enrich classroom experiences and improve educational outcomes. In today's digital era, especially within the framework of digital simulation learning, the application of 4.0 technology is not just beneficial it has become an essential component of modern education.

This study uses the digital simulation learning demonstration learning model 4.0.According to (Sahempa et al., 2021)which states the democratization learning model is a teaching model using visual aids to clarify an understanding or to show how a certain formation process works for students. So based on the expert opinion above where the demonstration learning model is a learning model that uses demonstration to teach the steps or stages of each learning process.

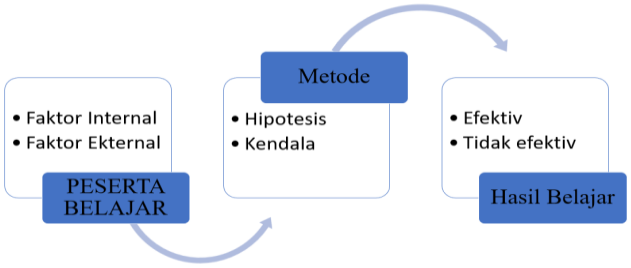
Learning Digital simulation seeks to offer useful learning resources, particularly in the current technological age. Three competency domains—the cognitive, psychomotor, and

affective domains—are evaluated during the learning process, and the results of these assessments are included in the evaluation of student learning outcomes. Assessment of student competence is something that is very important in teaching and learning activities because with the assessment of learning outcomes it can be seen how much success students have mastered the competencies or material that has been taught by the teacher. With the assessment can also be used as a reference to see the level of success or effectiveness in learning. According to Supriyono (2016: 1), learning is effective when it enables students to learn effortlessly, enjoy themselves, and meet learning goals in line with teacher expectations. Since teachers still control most of the learning that takes place in the classroom, learning in the classroom is less effective. To achieve learning effectiveness, a learning approach that is suitable for the students' circumstances is needed. The state of students during the learning process is crucial to attaining the best outcomes, so a method that is suitable for their circumstances is required in order to adequately accomplish the learning objectives. Teachers must carefully choose and implement effective teaching strategies and instructional media in order to attain the best possible learning outcomes. A learning method refers to a strategy or approach used to present specific subject matter in a way that helps students comprehend, internalize, apply, and ultimately master the material being taught.

Research Methods

The demonstration method, according to Syaipul (2016: 90), is a technique for teaching that involves showing pupils an actual or simulated process, circumstance, or object under study. This is frequently followed by an oral explanation. According to Muhibbin (2017: 22), the demonstration technique is a teaching strategy that involves directly exhibiting objects, procedures, guidelines, and steps involved in completing an activity, or using instructional media related to the topic or content being covered. Arikunto (2016: 197), on the other hand, claims that the demonstration technique is a means of imparting knowledge by showing a procedure or activity. This technique works incredibly well for illustrating an activity's steps. The instrument indicators for the demonstration method are as follows: Based on the above opinion, it can be concluded that the demonstration method is a teaching method by demonstrating directly or displaying a method of using instructional media that is relevant to the material presented.

The learning method that was seen to be used when the author conducted research at 11 Bengkulu Vocational Schools, especially in class X TKJ in digital communication simulation lessons, was the lecture method. Where students are only loyal listeners and cannot be active in the learning process. The conventional learning system results in students' learning enthusiasm that is less than optimal. Of the 11 schools that were given basic tripmen material, only 2 students were able to finish practical tasks on time, while 9 other students encountered difficulty in doing so, this was obvious from the incomplete learning assignments supplied. Meanwhile, ideal learning is learning that is able to encourage student creativity as a whole, makes students active, achieves learning goals effectively and takes place in pleasant conditions. Only when an ideal instructor facilitates learning can it be effective and meaningful. A high enthusiasm for teaching and the capacity to motivate students to advance are qualities that define the perfect teacher, according to Suyono (2017:207). Such a teacher ensures comprehensive coverage of all learning topics, delivers information clearly, applies diverse teaching methods effectively, and instills a sense of responsibility in students. An ideal teacher also has good classroom management skills, is receptive to criticism, and continuously assists students.In this study, one strategy employed by the researcher was to introduce the BENIME 2D application as a visual aid, specifically designed to present subject material in the "Simulation and Digital Communication" course. This approach increased student engagement, as they were more eager to observe, listen to, and understand the content being presented. The Simulation and Digital Communication subject itself aims to equip students with the skills to express ideas or concepts through digital platforms. During the learning process, students not only interpret ideas shared by others but also transform those ideas into tangible outputs using digital media. In his hypothesis, it can be seen from the following figure:



The goal of using the demonstrative learning method is to increase students' passion and level of interest throughout the learning process. Selecting the right teaching strategy is essential to getting the best learning results.By integrating video-based demonstrations into digital simulation subjects, educators can better identify the challenges or barriers faced by students during learning, thereby allowing for targeted improvements and more effective learning results.Research Hypothesis which is one of the answers that must be a temporary research concern to research problems, until proven through the data collected. The hypotheses in this study are: (1). There is the effectiveness of the demonstration learning method on the learning outcomes of class X students in simulation and digital communication lessons in 11 SMKs . (2). The results of this study indicate that the demonstration learning method did not have a significant effect on the learning outcomes of Grade X students in the Simulation and Digital Communication subject across 11 vocational schools (SMKs). Data collection was conducted using three main

indicators: observations, surveys, and documentation. These indicators were evaluated using a t-test analysis alongside observation sheets. The study focused on Grade X TKJ (Computer and Network Engineering) classes as the sample, involving students from 11 different schools. Data were gathered through questionnaire instruments and multiple-choice test sheets to assess students' academic performance and learning outcomes.

Research Result

Analysis resultsthat learning using the demonstration method is very effective, so that it has an impact on positive changes and an increase in class X student learning outcomes in digital communication simulation subjects.

Results of Tests of Normality

Keterangan	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
PreTest Angket	.172	11	.200*	.925	11	.358
PostTest Angket	.122	11	.200*	.970	11	.891
PreTest Pilihan Ganda	.282	11	.014	.882	11	.110
PostTest Pilihan Ganda	.234	11	.094	.878	11	.097

The results of the Kolmogorov-Smirnov normality test for student learning outcomes are presented in the table above. The test was performed on data from two groups: students instructed using the lecture approach (pre-test) and those instructed through the demonstration method (post-test). The significance value (p-value) for the observation questionnaire for the lecture approach (pre-test) was 0.200, whereas the p-value for the multiple-choice questions was 0.014. Simultaneously, the observation questionnaire for students instructed via the demonstration method (post-test) yielded a p-value of 0.200, while the multiple-choice assessment produced a p-value of 0.094. The pre-test and post-test data can be presumed to be regularly distributed, as most p-values above 0.05.(a) Homogeneity Test The homogeneity test was conducted to determine whether the data from the different groups have equal variances. In simple terms, homogeneity refers to the uniformity of data characteristics across groups. The homogeneity test was performed using SPSS software, with the following criteria for interpretation: 1) If the significance value (Sig.) > 0.05, the data variance is considered homogeneous. 2) The data variance is deemed heterogeneous if the significance value (Sig.) is less than 0.05.

Results of Instrument Tests of Homogeneity of Variances Questionnaire

Hasil Nilai Tes	*Levene Statistic*	df1	df2	Sig.
Based on Mean	.018	1	20	.895
Based on Median	.030	1	20	.865
Based on Median and with adjusted df	.030	1	19.943	.865
Based on trimmed mean	.014	1	20	.907

The results of the data homogeneity test on student learning outcomes, derived from a lecture-based pre-test and a demonstration-based post-test, are presented in the table above. The Levene test (F test) yielded a p-value of 0.895 for the analysis. The data is uniformly distributed as the p-value above 0.05.

Outcomes of Variance Homogeneity Tests for Multiple Choice Questions

Hasil Nilai Tes	*Levene Statistic*	df1	df2	Sig.
Based on Mean	.032	1	20	.859
Based on Median	.000	1	20	1.000
Based on Median and with adjusted df	.000	1	18.716	1.000
Based on trimmed mean	.020	1	20	.890

The Levene test (F test) was employed to analyze data collected from multiple-choice questions assessing student learning outcomes via the lecture technique (pre-test) and the demonstration method (post-test). The investigation yielded a p-value of 0.859. The data is homogeneous since the p-value exceeds 0.05, signifying that the variance between the two groups is not statistically different.

Present the results of the. Paired Samples Statistics T-Test

Instrumen Angket		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	*Pre Test*	20.18	11	2.089	.630
	Post Test	33.27	11	2.195	.662

The mean and standard deviation of student learning outcomes from the lecture technique (pre-test) and the demonstration method (post-test) are shown in the above table. Students instructed by the lecture method (pre-test) achieved an average score of 20.18 with a standard deviation of 2.089 on the observation questionnaire, as indicated in the table. Students who received instruction utilizing the demonstrative technique, on the other hand, performed better on the post-test, averaging 33.27 with a standard deviation of 2.195.

Results of the t-test for Paired Samples Statistics

Soal Pilihan Ganda		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	*Pre Test*	2.55	11	1.214	.366
	Post Test	7.73	11	1.104	.333

The results of multiple-choice questions are shown in the above table, which also highlights the mean and standard deviation of the learning outcomes for the students. On the pre-test, the average score for students who were taught by the lecture approach was 2.55, with a standard deviation of 1.214. A higher average score of 7.73 with a standard deviation of 1.104 was attained by students who were taught using the demonstrative approach (post-test).

Results of Paired Samples Correlations

Instrumen Angket	N	Correlation	Significance	
			One-Sided p	Two-Sided p
Pre Test & Post Test	11	.948	<.001	<.001

The table above presents the average difference in test results between student learning outcomes achieved through the lecture technique (pre-test) and those attained via the demonstration strategy (post-test). assessed with the independent samples t-test. This statistical test was selected due to the normal distribution of data in both groups. Based on the table, the independent samples t-test produced a t-value of 0.948 with a p-value of 0.001, indicating a statistically significant difference between the two sets of learning outcomes.

Results of Paired Samples Correlations

Soal Pilihan Ganda	N	Correlation	Significance	
			One-Sided p	Two-Sided p
Pre Test & Post Test	11	.943	<.001	<.001

The data obtained from the multiple-choice questions yielded a t-value of 0.943 and a p-value of 0.001, as demonstrated in the table above. The average learning outcomes of students instructed via the lecture method (pre-test) and those educated using the demonstration technique (post-test) exhibit a significant difference, as evidenced by a p-value of less than 0.05.

Paired Samples Test Results

Data Instrumen Angket							Significance	
			95% Confidence Interval of the Difference					
Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	One-Sided p	Two-Sided p
-13.091	.701	.211	-13.562	-12.620	-61.968	10	<.001	<.001

In order to determine the average difference in learning outcomes between students who were taught using the lecture approach (pre-test) and those who were taught using the demonstration method (post-test), a paired samples t-test was used, as shown in the table above. According to the table, the data from the questionnaire instrument yielded a standard deviation of 0.701 and a p-value of 0.001. This indicates a statistically significant difference between the two teaching methods.

Paired Samples Test Results

Data Soal Pilihan Ganda							Significance	
			95% Confidence Interval of the Difference					
Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	One-Sided p	Two-Sided p
-5.182	.405	.122	-5.454	-4.910	-42.485	10	<.001	<.001

Meanwhile, based on the table of multiple-choice question results, the standard deviation is reported as 0.405 with a p-value of 0.001. Both the questionnaire and multiple-choice data produce p-values below 0.05, it can be concluded that there is a significant difference in the average learning outcomes between students taught using the lecture method (pre-test) and those taught using the demonstration method (post-test).

Discussion

Based on the research results and hypothesis testing, the discussion in this study can be described in more detail. From the hypothesis that there is effectiveness between the use of lecture methods with demonstration methods to increase student learning outcomes. Judging from the learning outcomes of students in learning using the demonstration method the results are better than learning using the lecture method. Students who used the demonstration approach (post-test) had average scores of 33.27 on the questionnaire and 7.73 on the multiple-choice test, demonstrating the disparity in learning outcomes. Conversely, the pre-test results of students instructed using the lecture method were inferior, averaging 20.18 on the questionnaire and 2.55 on the multiple-choice examination. All 11 students in the digital simulation course exhibited moderate learning outcomes, with scores varying from 42.5% to 57.5%, as shown by the observation questionnaire utilized for the pre-test. In the post-test, a notable shift occurred: 3 students fell inside the sufficient category (75%–77.5%), whereas 8 students attained the high category (80%–92.5%). The pre-test findings indicated that two students were classified in the very low group (0%–10%), seven students in the low category (20%–30%), and two students in the sufficient range (40%–50%) according to the multiple-choice exam. In the post-test, the outcomes improved significantly, with 4 students in the adequate category (60%–70%) and 7 students in the high category (80%–90%). During the pre-test using the lecture method, students responded to both the questionnaire and multiple-choice questions largely based on guesses or limited prior knowledge. However, during the post-test with the demonstration method, students showed markedly improved performance in both instruments, indicating that the demonstration method had a more positive impact on their understanding and retention of the material. This is possible because students can observe and participate in the learning process firsthand when demonstrative approaches are used. According to Arikunto (2016: 197), the demonstration technique is a means of imparting knowledge by showing an activity or procedure. This technique works incredibly well for illustrating an activity's steps. From data processing using SPSS 28, the processing results are in line with research conducted by Listianti (2014) with the title "The Influence of Demonstration Learning Methods on Student Learning Outcomes in Class VII MTs Jama'qasar Materials". The results suggest that employing the demonstration method in the experimental class significantly enhances student learning outcomes. The improvement observed in both questionnaire and multiple-choice assessments suggests that this method enhances students' understanding and engagement more effectively than the traditional lecture method.

Conclusions and Recommendations

Based on the findings of the study, the implementation of the Demonstration Learning Model 4.0 in digital simulation learning for Grade X students has demonstrated positive and measurable impacts on learning outcomes. The evaluation, which was conducted through a trial sampling method, revealed that four students fell within the "sufficient" performance category, achieving scores ranging from 60% to 70%. Meanwhile, seven students reached the "high" performance category, with scores between 80% and 90%. These results clearly indicate that the Demonstration Learning Model 4.0 significantly enhances students' understanding and mastery of the material in a structured and practical manner. By providing students with hands-on experiences and direct observation, the model fosters active engagement, encourages critical thinking, and supports deeper conceptual comprehension. Overall, the application of this model not only increases academic achievement but also equips students with essential digital simulation competencies aligned with the demands of modern education in the era of Industrial Revolution 4.0.

Furthermore, the integration of this learning model can serve as a strategic tool for schools and educators in enhancing student achievement, which in turn can contribute to the overall improvement of school accreditation and quality of education.

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