

# The Effect of Electronic- Problem Based Learning on Students' Learning Styles, Interest, and Achievement

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## The Effect of Electronic-Problem Based Learning on Students' Learning Styles, Interest, and Achievement

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**Abstract:** Due to outbreak of Covid-19 pandemic, the educational paradigm must be shifted to an online education at all levels. Electronic problem-based learning (E-PBL) is one of learning models that can be implemented in fully online learning. The purpose of this study is to determine whether there is an effect of E-PB model on students' learning styles, learning interests and achievement on the entrepreneurial course. This study employed a survey research design. By using random sampling and a research sample consisted of 129 students from a private college in Indonesia. The data were collected by using students' learning style close ended questionnaire, students' learning interest close ended questionnaire and a problem-based test. They were analyzed by using Path Analysis. The finding shows that the use of the E-PBL learning model has a significant effect on learning interests and student entrepreneurship learning achievement, however, the use of E-PBL has little effect on learning styles. The E-PBL Model has an indirect effect on entrepreneurial learning accomplishment, which is mediated by the variable of learning interests. In digital era, it is recommended that the E-PBL learning model be used to increase effective and efficient learning styles, learning interests, and achievement in higher education.

**Keywords:** E-PBL, students' learning style, interests, achievement

### I. Introduction

Covid-19 is currently affecting the world of education, reducing learning activities and the role of teachers in the classroom. Online lectures, which have replaced face-to-face lectures, are a way to keep teaching and learning activities going as the corona virus spreads (Purwanti & Krisnadi, 2020). Online learning is a way to keep teaching and learning activities moving even while you are not in the classroom (Rachmat & Krisnadi, 2020). According to Sudarwati & Rukminingsih (2018) that the lecturers in the digital era should consider implementing the innovative and challenging classroom atmosphere of online lecture applications through e-learning as a medium. Harizan & Hilmi (2021) compared the effectiveness of distance education in delivering courses to traditional face-to-face instruction, finding that both techniques produced similar or greater learning results and similar or higher levels of student satisfaction.

Various alternate offers for online learning applications are progressively teaching methods during the pandemic. Suhada et al. (2019) describe several applications for online or online learning (on the network). Zoom, Google Classroom, and email are just a few examples of e-platforms. An educator, as a facilitator, provides students with learning experiences by expressing a problem or phenomenon that exists and is experienced by students in their daily lives. When authentic problems are used as a stimulus for student learning, learning activities become more relevant. One alternative strategy for better students' understanding to build broad knowledge is the application of E-PBL. It is a learning model that presents authentic and meaningful problem situations to students to arouse their interests in conducting investigations and inquiries. E-PBL encourages students' interest and achievement. Hendarwati, et al. (2021) show that there is an increase in learning activities and achievement of learning outcomes after the application of the E-PBL model on the entrepreneur course. Jiang, et al. (2022) stated that college students with entrepreneurial resource and experience, entrepreneurial education, practise experience, and entrepreneurial ideal, interest, and motivation had a higher entrepreneurial intention. One of the most important factors influencing student achievement is interest. Students with a strong interest in learning have a better chance of succeeding in school.

Electronic problem based learning (E- PBL) is a new type of learning environment that encourages dialogical learning. It is modified from PBL model which is integrated with technology support. According to Barrows (2002), PBL is a teaching strategy that helps students develop their problem-solving skills, which in turn promotes active learning and formation along a variety of topics and related disciplines. According to Duch, et al. (2001), PBL is a student-centered teaching method that fosters in students the ability to think creatively and solve problems in the real world. To enable students to participate in team-based evaluations, the entrepreneur course successfully mixes student diversity on learning styles, learning interests and students' achievement with appropriate technology (chat, discussion, and online). One of teaching strategies to answer the curriculum for 21<sup>st</sup> century is a teaching strategy which integrated with technology so the E-PBL model is one of the teaching strategy which integrated with technology. It is an innovative learning model that can provide active learning conditions for students in real-world situations in which students are required to learn through direct experience with problems. Hendarwati, et al. (2021) and Kladchuen and Srisomphan (2021) stated that during the Covid-19 pandemic, employing integrated PBL with online learning proved beneficial in accommodating the barriers of face to face students at the university level. Electronic-based PBL is effective in developing questioning skills, thinking skills, and problem-solving skills as well as independent learning. It is also stated by Divayana (2017) and Perdana, et al. (2020) that E-PBL provides students to lead the strength to explore further and deep materials through various resource online so they can build a lot their background knowledge to enhance their critical thinking and digital literacy skills to solve their task based on problems.

Our students come from a variety of learning styles including visual, audio and kinesthetic. Students with visual learning styles are more likely to write down what they've learned, remembering the shape and color of what they've seen and easily remembering faces. According to Fleming & Mills (1992), there are three kinds of learning styles. They are visual, audio and kinesthetics. Students with auditory learning styles prefer to speak what they have learned aloud or to themselves, enjoy listening to music but are easily distracted by noise, and remember names better than faces. While students with kinesthetic learning styles tend to learn better from their experiences, they enjoy physical activities and find it difficult to sit still. E- PBL can be offered effectively to students who study online by the careful design learning objectives, support mechanisms, and communication strategy in online environment. However It's unclear whether matching students' preferred learning styles to course delivery styles helps academic performance, and more research is needed in this area (Feeley & Biggerstaff, 2017; Newton & Miah, 2017).

Previous studies showed that matching the style of learning to preferred styles improved student success (Abdallah, et al., 2013; Clark & Latshaw, 2012; Lasry et al., 2014). Opponents of theory reported not important learning styles. (Newton & Miah, 2017; La Lopa & Wray, 2015). Similar research by Dincol (2011) showed that there was no relationship between total score on the Perceived Learning Style Inventory and academic performance. The current study builds on prior research that suggested matching teaching and learning styles was not beneficial. Although divergent, these points encourage further research.

Noncognitive behavior is one of the factors that influence learning. Interest is in the noncognitive aspect. Interest is one of the psychological factors that can encourage people to achieve objectives. Interest is a powerful motivator that energizes learning and guides academic and professional objectives. A student may be entertained by a presentation of the topic discussion, inspired by their own power, become more involved in class, and recognise the subject's personal significance. Thus, being interested implies that emotional reactions, perceived value, and cognitive functioning are all interwoven, and that attention and learning are both effortless (Ainley, 2006; Dewey, 1913; Hidi, 2006). Anyone who has an interest in a particular object tends to focus more on it. It was discovered that teachers and other educators ignore the function of learning styles in attracting students' attention to the lesson, especially since the majority of students believe that English is boring and difficult. Thus an interest factor could affect students' learning results. Interest is a strong motivator that energizes learning. Everyone has the power to enhance interest for motivation and engagement. Students' interest is increased when technology is used in the learning process (Renninger, 2016 & Walkington, 2013) According to some research, students who participate in PBLs have more positive attitudes on the course and are more interested in pursuing the knowledge and get satisfying achievement (Munawaroh 2020; Hendarwati, 2021; Riyadi, et al., 2018). However, this research is not supported by Maulana (2017) stated that there is little influence of motivation on learning outcomes in the problem-based learning model with the help of mobile learning in economics courses by 41%. It showed that PBL couldn't enhance the students' motivation and achievement.

This study was different from previous studies because there was no topic or discussion regarding the effect of E-PBL on students' learning style, interest, and achievement. Thus, we need to investigate among those variables. In this study, the researchers analyzed the effect among those variables. Therefore, this study was conducted to answer the research questions below:

1. How is the effect of students' learning interest on students' achievement?
2. How is the effect of learning styles toward students' achievement?

3. How is the effect of learning styles on students' learning interest?
4. How is the effect of Electronic –Problem Based Learning on students' achievement?
5. How is the effect of Electronic –Problem Based Learning on students' interest?
6. How is the effect of Electronic –Problem Based Learning on students' learning style?

## II. Materials and Methods

The research method used in this study was a quantitative survey. Creswell (2012) defined survey research designs are procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people to describe characteristics of the population to measure certain theory by researching effects between two or more variables. Therefore, the researchers used a quantitative survey in this study. The objective of this study is to analyze the effect of the E-PBL on students' learning styles, learning interest, student entrepreneurial learning achievements during the Covid-19 pandemic. The population in this study was 236 students of the STKIP PGRI Jombang Economic Education Study Program. The sample were 129 students consisting of students in the 2017/2018 and 2019 academic years. A random sampling technique was used to determine that sample. It was done to give students equal chances and opportunities (Taherdoost, 2016).

The instruments used were students' learning styles questionnaire, students' learning interest questionnaires, E-PBL questioner and a problem-based test with the google form application. The students' learning styles questionnaire aimed to obtain data on determining the kinds of the students learning styles which is involving visual, audio and kinesthetic adopted from (DePorter & Mike 2016.) The questionnaire had total of 30 items of students learning styles with three sensory preference dimension indicators involving visual learners, audio learners, and kinesthetic learners. The questionnaire was answered by two choices, namely Yes and No. While students' learning interest was used to have the data on students' learning interest regarding E-PBL during learning entrepreneur course. The questionnaire was adapted from Maidan, et al. (2019) which has 4 indicators involving feeling happy, engagement, interest, and attention. The questionnaire which had total of 15 items was filled on Likert scale with five choices, namely strongly agree, agree, agree, normal, disagree, strongly disagree. Then the E-PBL use questionnaire aimed to gain the data on the usage of E-PBL during learning process. The questionnaire which had total of 20 items was filled on Likert scale with five choices, namely strongly agree, agree, agree, normal, disagree, strongly disagree. The problem based test consisting 25 items by using multiple choice in Entrepreneur course.

The research variables included the use of the E-PBL model and endogenous variables, namely styles of learning, learning interest and learning outcomes. The relationship between variables can be formulated in the following equation based on the literature review and previous empirical studies:

$$LS = \beta_1 PBL + \varepsilon_1 \quad (1)$$

$$LI = \beta_1 PBL + \beta_2 LS + \varepsilon_2 \quad (2)$$

$$LA = \beta_1 PBL + \beta_2 LS + \beta_3 LI + \varepsilon_3 \quad (3)$$

Explanation :

PBL = Problem Based Learning

LM = Learning Method

LI = Learning Interest

LA = Learning Achievement

While the data analysis using Path Analysis test, as follows

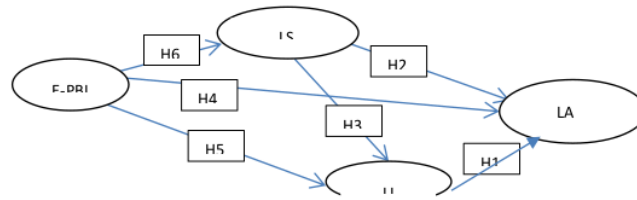


Figure 1. Path Analysis Model

### III. Results

This study has six findings dealing with the effect of E-PBL on students' learning style, interest and achievement in entrepreneur course by using PLS to evaluate a model as the following figure 2.

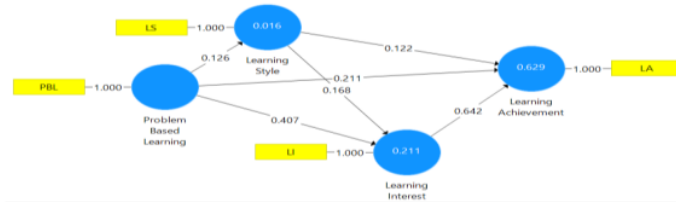


Figure 2. Statistics decomposition model

When using PLS to evaluate a model, the first step is to look at the R square value for each dependent latent variable. The following are the results of the R square analysis using PLS, as shown in Table 1:

Table 1. R Square

	R Square	R Square Adjusted
Learning Achievement	0,629	0,621
Learning Interest	0,211	0,198
Learning Style	0,016	0,008

According to table 1, the R square value of the learning achievement variable is 0.629, indicating that interest in learning and learning styles influence 62.9 percent of the learning achievement variable. The R value of the study variable is 0.211 meaning that 21.1% of the learning interest depends on the learning styles variable. The R-square value of the learning styles variable is 0.016, which means that the E-PBL model affects 1.6 percent of the learning style.

The significance of the estimated parameters is quite helpful in determining the link between study variables. The value contained in the output for inner weight is the basis for testing the hypothesis. Table 2 shows the estimated output for testing the structural model. Based on the results of the Path Analysis Test described above, it is possible to see the statistical results for each variable as well as the level of causal influence between endogenous variables and exogenous variables. These findings serve as the foundation for the following discussion of the research:

Table 2. Path Coefficients: Mean STDVE, T- Value, P Value

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Learning Interest -> Learning Achievement	0.642	0.708	0.156	4.108	0.000
Learning Styles-> Learning Achievement	0.122	0.098	0.059	2.074	0.039
Learning Styles-> Learning Interest	0.168	0.173	0.073	2.296	0.022
Electronic- Problem Based Learning -> Learning Achievement	0.211	0.177	0.088	2.401	0.017
Electronic- - Problem Based Learning ->	0.407	0.415	0.059	6.950	0.000



#### Learning Interest

Electronic- - Problem Based Learning -> Learning Style	0.126	0.127	0.081	1.558	0.120
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**Table 3. Specific Indirect Effects Mean, STDEV, T-Values, P-Values**

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Learning Interest -> Learning Achievement	0.642	0.708	0.156	4.108	0.000
Electronic- Problem Based Learning -> Learning Styles-> Learning Interest -> Learning Achievement	0.014	0.016	0.015	0.940	0.348
Electronic-- Problem Based Learning -> Learning Interest -> Learning Achievement	0.261	0.292	0.075	3.505	0.000
Electronic- Problem Based Learning -> Learning Styles-> Learning Achievement	0.015	0.013	0.013	1.182	0.238
Electronic- Problem Based Learning -> Learning Styles-> Learning Interest	0.021	0.022	0.018	1.192	0.234

Based on table 3, it is known that the use of the E-PBL model has an indirect effect on entrepreneurial learning achievement, which is mediated by a significant learning interests variable, as evidenced by the t value of 3.505 > t table (1.96) and p value of 0.000 0.05 with a coefficient of 0.261, while the others are not significant.

#### The Effect of Students' Learning Interest on Students' Achievement

The results of the first hypothesis testing shows a positive and significant influence between learning interestss and entrepreneurial learning achievement, as evidenced by the t value of 4.108 > t table (1.96) and p value of 0.000 0.05 with a coefficient value of 0.642, as shown in table 2 by employing Path Analysis. The test results show that learning interestss has a positive and significant influence on entrepreneurial learning achievement, as evidenced by the t value of 4.108 > t table (1.96) and p value of 0.000 0.05 with a coefficient value of 0.642.

#### The Effect of Learning Styles on Students' Achievement

The results of testing the second hypothesis shows a positive and significant relationship between learning styles and entrepreneurial learning achievement, as evidenced by a t value of 2.074 > t table (1.96) and a p value of 0.039 0.05 with a coefficient value of 0.122. The hypothesis testing results showed that learning styles have a positive and significant influence on entrepreneurial learning achievement, as evidenced by the t value of 2.074 > t table (1.96) and p value of 0.039 0.05 with a coefficient value of 0.122.

#### The Effect of Learning Styles on Students' Learning Interest

The results of testing the third hypothesis indicates that there is a positive and significant effect between learning styles on interestss in learning as evidenced by the t value of 2.296 > t table (1.96) and p value of 0.022 < 0.05 with a coefficient of 0.168. The hypothesis testing results showed that there was a positive and significant relationship between learning styles and interestss in learning, as evidenced by the t value of 2.074 > t table (1.96) and the p value of 0.022 0.05 with a coefficient value of 0.168.

#### The Effect of Electronic - Problem Based Learning on Students' Achievement

The results of the fourth hypothesis testing shows that using the E-PBL model has a positive and significant effect on entrepreneurial learning achievement, evidenced by the t value of 2.401 > t table (1.96) and p value of 0.000 < 0.05 with a coefficient value of 0.017. The results of hypothesis testing indicate that there is a positive and significant effect between the use of the EPBL model on learning achievement as evidenced by the t value of 2.401 > t table (1.96) and p value of 0.000 < 0.05 with a coefficient value of 0.017. The results of research analysis which state that there is an effect of E-PBL on Entrepreneurial Learning Achievement are in line with the following supporting theories: problem-based learning models combined with e-learning applications (E-PBL) have better advantages in terms of achieving student learning outcomes.

#### **The Effect of Electronic –Problem Based Learning on Students' Interest**

The results of the fifth hypothesis testing shows that using the E-PBL model has a positive and significant effect on learning interestss, as evidenced by the t value of 6.950 > t table (1.96) and p value of 0.000 < 0.05 with a coefficient value of 0.407.

#### **The Effect of Electronic –Problem Based Learning on Students' Learning Style**

The test results for the sixth hypothesis shows that there is no significant effect of using the E-PBL model on learning styles, as evidenced by the t value of 1.558 < t table (1.96) and the p value of 0.120 > 0.05 with a coefficient of 0.126. The hypothesis testing results show that there is no significant effect of using the EPBL model on learning styles, as evidenced by the t value of 1.558 < t table (1.96) and the p value of 0.120 > 0.005 with a coefficient of 0.126.

### **IV. Discussion**

As the literature implies in this study, the electronic-Problem-Based Learning (E-PBL) model outperformed traditional learning. Furthermore, the Electronic-based Problem-Based Learning (E-PBL) model directly involves students in the Economics Education Study Program in understanding Entrepreneurship material by engaging directly in problem solving with directed steps, and it can help students become more independent. The use of the Electronic-based Problem-Based Learning (E-PBL) model will foster collaboration among members of diverse groups. Furthermore, with the help of the E-PBL model application, economic education students can be more active in problem solving activities because they can directly observe and do it themselves with the EPBL application. Students' interestss and attention to learning can be increased. (Renninger and Hidi 2016; Walkington 2013). So, present study focused on the variables for the effect of E-PBL toward students' learning style, interest and achievement.

The first result shows that the interest and focus of students on enterprise courses stimulates enthusiasm for undertaking enterprise tasks through the E-PBL model, responsibility for students' task, student responses to teachers' stimulation and the pleasure of students in entrepreneurship activities. It is inline with Renninger & Hidi (2016) that there is an influence of interest in learning on entrepreneurial learning achievement, are consistent with the following supporting theories: Interest is a strong motivator that energises learning and directs academic and professional goals. A student may be entertained by a presentation about the topic discussion, get cited by their strength, become more engaged in the class, and comprehend the subject's personal importance. Thus, being in a state of interest implies that emotive reactions, perceived value, and cognitive functioning are all intertwined, and that attention and learning are both effortless (Ainley, 2006; Dewey, 1913; Hidi, 2006). In other words, Interest can be defined as "the tendency of subjects to remain, to be interested in a particular field of study or subject and feel happy. study the material." Students have a high interest in learning in entrepreneurship courses, the hope for success will be greater. As a result, the level of student interest in learning has a significant impact on the continuation and success of student learning. This is in line with the research of Benta et al. (2014), which found that while using an e-learning platform, students showed a greater interest in and willingness to do more difficult homework. E-learning, according to Valentina and Nelly (2014), encourages student interaction and the emergence of academic interests.

The second result shows that it can be seen that learning styles is the most important thing that educators should know the kinds of their students' learning styles during on the classroom learning. The findings of the research analysis, which showed that learning styles have an impact on entrepreneurial learning achievement, were consistent with (Abdallah, et al., 2013; Clark and Latshaw, 2012; Lasry and Whittaker, 2014). However, it has been reported not important learning styles (Newton & Miah, 2017; La Lopa and Wray, 2015). Similar research by Dincol, et al. (2011) showed that there was no relationship total score on the perceived learning style.

The third result shows that learning styles has an impact on Entrepreneurship Learning Interest, are consistent with the following supporting previous studies. Every student has a unique learning style. The lecturer must pay close attention to this case because, in addition to their characteristics and intellectual ability, each teaching will be dependent on the way or styles of learning of the students (Papilaya & Huliselan, 2016).

Teachers must analyze students' learning styles in order to make them feel comfortable while learning English. Each student has a unique learning style and personality (Rezaeinejad, et al., 2015). According to Feeley and Biggerstaff (2017) teachers and other educators ignore the function of learning styles in attracting students' attention to the lesson. To face this problem, Mangendre (2015) states the teacher is better to have good preparation between material and learning situations. To address this issue, Munawaro (2020) and Mangendre (2015) suggests that teachers should have good preparation between material and learning situations.

The forth result shows that there is an effect of E-PBL on Entrepreneurial Learning Achievement are in line with the following supporting theories: problem-based learning models combined with e-learning applications (E-PBL) have better advantages in terms of achieving student learning outcomes. This finding is consistent with the result of a previous study, Munawaroh (2020) found that the problem-based learning model combined with e-learning applications (E-PBL) is capable of assisting students in solving and exploring critical thinking skills, as well as creating student interest in solving learning problems. This finding is consistent with previous research findings. Tugwel (2020) stated that the problem-based learning improves students' academic progress in Digital Electronics. According to Hendarwati (2021); Kladchuen, and Srisomphan (2021) and Munawaroh (2020), the use of problem-based learning models results in a higher average value of learning achievement. As a result, learning through problem-based e-learning can boost Entrepreneurial Learning Achievement.

This fifth result is consistent with the result of a previous study, Hendarwati (2021) and Kladchuen and Srisomphan (2021) found that the Problem Based Learning model combined with e-learning applications (E-PBL) is capable of assisting students in solving and exploring critical thinking skills, as well as creating student interest in solving learning problems. This finding is consistent with previous research findings. According to Munawaroh (2020) and Maulana (2017), the use of problem-based learning models results in a higher average value of learning achievement. As a result, learning through problem-based e-learning can boost Entrepreneurial Learning Achievement. optimally for both students with students' learning interest.

The sixth result shows that the impact of E-PBL on Entrepreneurial Learning styles, are consistent with the following supporting theories: More advantages exist when problem-based learning models are combined with e-learning applications (E-PBL). PBL has been validated as an educational styles that can be effective for students who learn best through either of the major modes of teaching and thus contributes to student learning needs and style. These results reflect the results of previous studies, which showed that the Problem-based Learning Model, combined with the application of E-PBL, helped students solve problems, carried out Explore and create attractiveness for students in different learning styles (Feeley and Biggerstaff, 2017; Abdallah and Aqabawi, 2013; Anderson, 2016).

## V. Conclusion

Based on the result and discussion, this study concluded that implementing Electronic problem-based learning (E-PBL) toward students' learning style, students' learning interest and students' achievement in entrepreneurship course involving as the following 1) there is a significant influence between interest and learning achievement in entrepreneurship, 2) there is a significant influence between learning styles and entrepreneurial learning achievement, 3) there is a significant influence between learning styles and learning interest, 4) there is a significant effect between E-PBL and entrepreneurial learning achievement 5) there is a significant effect between EPBL and learning interest, 6) There is no significant effect between E-PBL and learning style. There is an indirect effect of using the E-PBL model on entrepreneurial learning achievement mediated by the variable interest in learning.

The implementation of the results of this study is that E-PBL is effective teaching strategy to teach entrepreneurship course toward students' learning style, interest and achievement. In entrepreneurship course, it is more optimally achieved if they are facilitated with E-PBL model as the innovative teaching strategy. This study found that the students with different learning style, interest and higher achievement were accommodated with E-PBL, but they should be provided with more intensive guided to be able to engage in their learning process.

Therefore, this study recommends that E-PBL toward students learning style, interest and achievement was effective to be implemented at high school students either during the Covid 19 pandemic and new normal era. It also recommended that e-learning media be used in combination with other learning models during the learning process. The use of e-learning media in combination with problem-based learning models should be applicable to other courses without losing the problem-based learning model's characteristics.

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