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THE EFFECTIVENESS OF *BLENDED LEARNING*, PRIOR KNOWLEDGE TO THE UNDERSTANDING CONCEPT IN ECONOMICS

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ABSTRACT

This research aims to determine the effectiveness of blended learning strategies for individuals and groups to improve the understanding of concepts in mathematics courses, based on prior knowledge possessed by students. Targets to be achieved from this research is to test the significance of the results of learning about: a) the ability of understanding the concept of linear functions in blended learning individual vs. group, b) differences in the ability of understanding the concept of linear function between students with high prior knowledge and low prior knowledge, and c) whether there is an interaction of the application of blended learning individual vs. group and prior knowledge of the capabilities of understanding the concept of a linear function. Teaching methods used in this research are a web-based teaching and face-to-face teaching, conducted individual and group.

Data collection was conducted in two phases: the preparation and implementation stages of the research. Research has independent variables in the form of blended learning is done in individual and group, the dependent variable of the ability of understanding the concept of a linear function of the material, and a moderator variable of high and low prior knowledge.

Keywords: Blended learning, prior knowledge, understanding concepts

INTRODUCTION

Along with the development of science and technology it is a paradigm shift in education. As we all know if the first lesson is *teacher centered learning* where textbooks and teachers are the most important source of knowledge for the learner, the learning process has now shifted to *student centered learning* where textbooks and teacher is no longer the most important source of knowledge but learners can explore science through other media such as newspapers, television and the internet.

Distribution of education in Indonesia has many obstacles, among which are the geographical conditions in which Indonesia is an archipelago country that issues of transport and the distance is a major problem which is the bottleneck of teachers to teach. Transportation is difficult and long distance required make government spending more expensive that education can be obtained by Indonesian citizens residing in the islands besides Java. Various efforts have been made to solve this problem for example by sending teachers to teach in elementary and junior high schools are located in the islands, sending books package, sending the students who excel learn in Java to pass and then required to re-develop the area.

In addition to the efforts stated above, another attempt of the government is to utilize technology to facilitate the development of educational equity. The government made an

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educational long distances program (PJJ), which is according to Soekartawi (2006) PJJ has specific characteristics, are as follows:

1. Separate learning activities with teaching learning activities.
2. During the learning process, students as learners and teachers as educators separated by a space, distance and time or a combination of all three.
3. Communication between them assisted with instructional media, both printed media (in the form of teaching materials module) and electronic media (CD-ROM, VCD, telephone, radio, video, television, computer).
4. Services are provided to both students and teachers, such as *resource learning center*, teaching materials, learning infrastructure, and so on). Thus both students and teachers do not have to seek their own purposes in the teaching-learning process.
5. Communication between students and teachers can be done either by one way or two-ways communication. The examples of two-way communication, such as *tele-conferencing, video-conferencing*, and so on).
6. Teaching-learning process in PJJ is still possible to conduct face-to-face meetings (tutorial), although it is not a necessity.
7. During the learning activities, students tend to form study groups, although it is not fixed and is not mandatory. Group activities necessary to facilitate student learning.
8. Teacher's role is more as facilitators and students act as *participant*.

Frequency due to face-to-face learners and teachers just a little, then found some problems were found in the PJJ process. Authors observe constraints include (1) lack of interaction between the learner and teachers can affect learning outcomes, (2) the process of learning takes place such as training, (3) learner motivation greatly affect the success of the study, (4) learning takes quite a long time, because learners do not have a place to ask directly, (5) learning styles and cognitive styles individualy is different, and (6) prior knowledge affect learning outcomes.

To overcome these obstacles needed another effort from teachers so that learners can be better understand the material being studied. Referring to the explanation Soekartawi particular explanation in point 6, it is currently used combining methods to improve learning outcomes between face-to-face and online learning or offline learning method. This method is commonly known by the term *Blended Learning*.

Some of the reasons being the foundation of learning strategy use of *blended learning*, including the proposed Bonk Osguthorpe and Graham (2006) who identified six grounds in the selection and use of *blended learning* design, namely, (1) ensuring that the management of learning, (2) access to knowledge, (3) social interaction, (4) personal agency, (5) cost-effectiveness, and (6) ease of revision. While Graham, Allen and Ure also in Bonk (2006) revealed that the main reason is the use of blended learning (1) improvisation in learning, (2) increased access and flexibility, and (3) increased cost-effectiveness.

Blended learning is applied in PJJ implemented based on the principles of freedom, independence, flexibility, currency of, compliance, mobility, and efficiency. Learning blended learning can be done individually or in groups, it is highly dependent on the means of study and learning habits of a person. Learning tool in question is a computer and internet

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facilities are available at the school and residential learners, while learning habits are prevalent form of business learners to gain maximum learning outcomes.

In eight specific traits expressed by Soekartawi, one of them explained that during the learning activity, students tend to form study groups, although it is not fixed and is not mandatory. Although it is an optional, but to improve learning outcomes in *blended learning strategy* should be to design learning learners form groups for the purpose of the construction of knowledge and skills through the process of understanding the concept of social or social interaction with others.

The Importance of mastering math is not currently matched by the ability of the learner's achievement of majority Indonesia, as expressed by the *Trends in Mathematics and Sciences Study (TIMSS)* in 2008 that put math and science skills in Indonesia ranked 34th out of 45 countries. Wahyudin (2009) suggested that the low quality of mathematics education in particular due to the weakness of the four reasons for poor learning outcomes, namely,

1. Lack the prerequisite knowledge of materials,
2. Lack the ability to understand and recognize the basic concepts of mathematics (such as definitions, theorems, axioms, arguments, rules) relating to the subject being discussed,
3. Lack of accuracy in listening and recognizing mathematical problem related to a particular subject, lack of the ability to listen back to an answer obtained (whether an answer is possible or not),
4. Lack of logical reasoning ability in solving mathematical problems.

Hudojo (2008) suggests that in the process of learning mathematics, learning principles must first be selected, so as to learn mathematics teaching and learning can take place smoothly, for example studying the concept of B is based on the concept of A, learners need to first understand the concept of A. Without understanding concept of A, learners may not understand the concept of B. This means that learning mathematics should be gradual and sequential, and based on the past learning experience. So that when the teacher explains a new concept, learners have been able to understand the issues being discussed. Understanding of the concept of sustainable expected to increase interest and achievement of learners of mathematics. Lack of understanding leads to low ability learners to apply mathematical concepts, so that the overall result of the above problems is the low learning outcomes.

Not all of the causes of the lack of understanding the concept originated from the student (internal factors), another factors (external factors) is presumed to be the cause of the lack of understanding of mathematics concepts.

The situation affects learners in understanding the basic concepts contained in the subject matter of mathematics, so that learners can inhibit creativity in answering the questions.

Many factors affect the success of learning apart from the lack of understanding of the concept and how material explained by the teacher. Prior knowledge learners also affect learning outcomes, because prior knowledge is the beginning of knowledge, skills, or abilities that a learner into the learning process (Jonassen and Gabrowski; 2006). Some research findings suggest that the level of prior knowledge and cognitive styles have an influence on the type of task and the acquisition of learning.

Based on the explained above seems to have done a research that aims to determine the effectiveness of *blended learning*, prior knowledge of the understanding of concepts in particularly the concept of linear functions in mathematics courses. The concept of linear

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function is very important to understand by students, especially students majoring in economics, this is because the students through the concept of a linear function will be easy to understand about the economic growth from year to year (time series), to predict the selling price of an item, the amount of demand, market equilibrium, taxes, subsidies, national income, and so forth.

REVIEW OF LITERATURE

Blended Learning

Blended learning is basically a combination of learning is done face-to-face and virtually. According to Semler (2009) is

> "Blended learning combines the best aspects of online learning, structured face-to-face activities, and real world practice. Online learning systems, classroom training, and on-the-job experience have major drawbacks by themselves. The blended learning approach uses the strengths of each to counter the others' weaknesses."

Driscoll's (2012) definition of dividing it into four, namely,

I. Combining or mixing web-based technology to accomplish an educational goal.
II. Combining pedagogical approaches (e.g. constructivism, behaviorism, cognitivism) to produce an optimal learning outcome with or without learningal technology.
III. Combining any form of learningal technology with face to face instrucktor-led training.
IV. Combining learningal technology with actual job tasks.

Based on the explained above it can be concluded that *blended learning* is a learning strategy that integrates face-to-face and distance learning using online and offline learning resources, and presents a variety of communication options that can be used by learners and teachers. *Blended learning* is carried out with the aim to enhance the learning process, save costs, independence training, and using technology for education.

Prior Knowledge

Requirement that a person can master a new knowledge that he had prior knowledge. According to Jonassen and Gabrowski prior knowledge is the knowledge, skills, or abilities that a learner into the learning process. Meanwhile, Addison and Hutcheson (2010) defines knowledge as early as existing knowledge, knowledge about the world, knowledge skills, and prior knowledge.

Research conducted by Addison and Hutcheson (2010) conclude that there is a significant difference in comprehension scores between the groups that have been studied earlier with the knowledge that no prior knowledge learned. Prior knowledge suggests that the understanding and application of the new concept will be highly dependent on the application of relevant prior knowledge to new knowledge.

The Capabilities of Understanding Concept

In math comprehension ability is one of the important goals in learning. Learners are given the sense that the material being taught not to memorize but to be understood, as to understand the learners will understand the concept of the material being studied. Hudoyo (2003) explains that the purpose of teaching is to be understood given knowledge of learners.

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Good education is a successful effort to bring learners to the goal to be achieved is that the material delivered fully understood by learners.

Understanding of a concept is the absorption of the material being studied, which in Bloom's taxonomy located on the second cognitive level. Revision of Bloom's taxonomy of knowledge dimension includes three aspects, namely, a) Factual knowledge, b) Conceptual knowledge which includes classifying and categorizing knowledge, knowledge of principles and generalizations, and the knowledge of theories, models and structures, and c) Procedural knowledge that includes knowledge of specific skills material (subject-specific) and algorithms, knowledge of the techniques and methods of special materials (subject-specific), knowledge of the criteria to determine when to use appropriate procedures.

Therefore, we expected to grasp an object learners can understand the ideas of the material being studied and may use some of the relevant rules.

According to the NCTM comprehension skills can be seen in one's ability to, a) defining concepts verbally and in writing, b) dentify and create examples and not examples, c) using models, diagrams and symbols to represent a concept, d) changing a form of representation to other forms, d) Knowing the various meanings and interpretations of the concept, e) Identifying the properties of a concept and recognize conditions that define a concept, and f) Comparing and contrasting concepts.

In relation to the expected learning objectives on understanding concepts, teachers are required to provide learning materials in a sequence that is, learners are given the basic concept before teaching difficult concepts. The basic concept which has been well understood by the learner can be a sturdy bridge to develop the new concepts that are more difficult.

Some research reveals that the use of media in teaching can improve understanding of the concept. Researchers who conducted the research include Sinaga (2010) which revealed that the use of virtual simulation media on interactive conceptual learning can be more effective in increasing the understanding of the concept.

RESEARCH METHODS

The research was designed using a model of quasi-experimental research, Suhardjono (2008) explained that the experiment the research has three main characteristics, namely the presence of (1) the independent variables are manipulated, (2) the control of all other variables, except for the independent variables are manipulated, and (3) observation and measurement of the dependent variable as a result of the manipulation of independent variables. This research takes two groups of subjects were selected randomly, one experimental group and one control group.

This Research is aimed to examine the independent variable to the dependent variable, as well as a quantitative research. Quasi-experimental is used in this research due to constraints in the process of randomization in full to the selection of research subjects (Ary, Jacobs, and Razavieh, 2002). The control group in this study is a *blended learning* instructional strategies individually, while the experimental group is learning *blended learning* strategy for the group. The treatment for the experimental group by forming groups of 2-3 people at last face

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to face method. The design used in this research are *nonequivalent pre-test-post-test control group design* (Tuckman, 1999; Subana and Sudrajat, 2005).

Operational Variables

Independent Variables

The independent variable of this research is how the implementation of blended learning instructional strategies are given individually and groups.

Moderator Variables

Moderator variables in this study are the characteristics of students in the form of prior knowledge about the linear function material which is divided into two parts, namely high and low prior knowledge. Prior knowledge of linear function is used as a test for prior knowledge about the materials that have been obtained by students when they studied at junior high school and senior high school.

Dependent Variable

The dependent variable in this study is an understanding of the concept of a linear function. The instrument is used to measure pre-test and post-test questions were developed based on specific learning objectives listed in the textbook Economics Mathematic courses. Pre-test is intended to determine the extent of understanding the concept of a linear function of student owned before obtaining treatment, while the post-test is intended to determine the extent of understanding of the concept of linear function held student after obtaining treatment.

Before the instruments used, the first is conducted trials to determine the level of content validity and reliability. This is necessary in order to determine whether these tests actually measure the material that has been learned or should have been learned by students.

Table 1 below describes the results of testing the validity of understanding the concept of a linear function.

Sampling

The experiment was conducted in STIE Ekuitas Bandung and the subject of this research is the students of Accounting who received Economics Mathematic course. The Planning are the number of students involved as many as 75 samples were divided into 2 classes (1 class are treated *blended learning* strategy individually and the other class treated by *blended learning* strategy in groups, where each group consists of 2-3 people). Student decision was based on students who have passed the Introduction to Computers course, so all students are expected familiar with and able to use the internet. Table 1. shows the distribution of the samples in this study,

Tabel 1. The Research Samples

Group	Classes sampled	Amount
Individual *Blended Learning*	Ak-1	36
Group *Blended Learning*	Ak-2	39
Total		75

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FINDINGS

Based on normality test through the *Kolmogorov-Smirnov* and *Shapiro-Wilk* obtained calculation results are presented in Table 2 below.

Tabel 2. Normality Test Score of Understanding Concept of Linear Functions based Learning Strategy

Tests of Normality

	Learning Strategy	*Kolmogorov-Smirnov*[a]			*Shapiro-Wilk*		
		Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Understanding Concept	Individual - BL	.111	43	.200*	.940	43	.026
	Group - BL	.125	44	.081	.953	44	.071

Kolmogorov-Smirnov test for understanding the concept of linear functions through individual *blended learning* strategy and group *blended learning* strategy and each has a significance value of 0.200 and 0.081, while through the *Shapiro-Wilk test* for a significance level of understanding of the concept of linear functions through individual *blended learning* strategy and group *blended learning* strategy of each has a significant value of 0.026 and 0.071. Based on the test results that the majority have a significance level greater than 0.05, it can be said that score data of the ability of understanding the concept of linear functions distributed normally.

Tabel 3. Homogeneity of Variance Test Score of Understanding Concept of Linear Functions based on Learning Strategy

		Levene Statistic	*Sig.*
Understanding Concept	Based on Mean	4.501	.087
	Based on Median	3.555	.063
	Based on Median and with adjusted df	3.555	.063
	Based on trimmed mean	4.421	.038

Homogeneity testing process by using,

H_0: The two variances homogeneous

H_1: The second variance is not homogeneous

Testing criteria are,

- If sig> 0.05, then H_0 is accepted
- If the sig <0.05, then H_0 is rejected

The calculation in the table above 3 shows that the mean of understanding the concept of a linear function of the numbers of significance is 4.501 and 0.087 which means greater than 0.05. Figures significance greater than 0.05 applies if the measurement is taken through the *median*, where the numbers of significance is 0.063. The conclusion of the above calculation is the data derived from populations having the same variance (homogeneous).

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Normality and Homogeneity Test Results Understanding Concepts Based on Prior Knowledge

Based on normality test through the *Kolmogorov-Smirnov* and *Shapiro-Wilk* obtained the calculation results are presented in table 4.12. below,

Tabel 4. Normality Test Score of Understanding Concept of Linear Functions Based on Prior Knowledge

Tests of Normality

	Prior Knowledge	*Kolmogorov-Smirnov*[a]			*Shapiro-Wilk*		
		Statistic	*df*	*Sig.*	*Statistic*	*df*	*Sig.*
Understanding Concept	High	0.166	44	0.094	0.911	44	0.092
	Low	0.118	43	0.146	0.961	43	0.152

Based on the test results that the majority have a significance level greater than 0.05, it can be said that score data of the ability of understanding the concept of linear functions based on prior knowledge distributed normally. The next step after a known normal distribution of data is to examine the homogeneity of variance scores capabilities for understanding the concept of a linear function of the two groups of samples. For this study the test performed using *Levene's test*, while the results of the calculations can be seen in the table below,

Tabel 5. Homogeneity of Variance Test Score Understanding the Concept of Linear Functions based on Prior Knowledge

		Levene Statistic	*Sig.*
Understanding Concept	Based on Mean	0.001	0.982
	Based on Median	0.015	0.904
	Based on Median and with adjusted df	0.015	0.904
	Based on trimmed mean	0.012	0.914

The calculation in the table above 5, showed that to understanding the concept of a linear function based on the average (mean) level of significance is 0.982, which means greater than 0.05. Figures significance greater than 0.05 applies if the measurement is taken through the median, where the numbers of significance is 0.904. The conclusion of the above calculation is the data derived from populations having the same variance (homogeneous).

Results of test calculations based on the normal distribution and homogeneity of learning strategies and prior knowledge, all have normal distribution and homogeneous. The next step is to test the hypothesis by using Anova based on the following criteria,

H_0: There is no significant difference between the ability of understanding math between class of individual blended learning strategy and group *blended learning* strategy.

H_1: There is a significant difference between the ability of understanding math concepts between class of individual *blended learning* strategy and group *blended learning* strategy.

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Tabel 6. The Anova Calculation results of The Influence Learning Strategies to Understanding Concepts

Tests of Between-Subjects Effects

Dependent Variable:NILAI PK (GPA SCORE)

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	139.331[a]	1	139.331	13.398	.000
Intercept	14942.918	1	14942.918	1436.928	.000
SP	139.331	1	139.331	13.398	.000
Error	883.933	73	10.399		
Total	15935.000	75			
Corrected Total	1023.264	74			

a. R Squared = 0.136 (Adjusted R Squared = 0.126)

Analysis of the test results are presented in Table 6 shows the test results showed the significance of 0.000, because the sig <0.05 means that H_0 is rejected, it showed no significant difference to the ability of understanding the concept of linear function between classes with individual *blended learning* strategy and group *blended learning* strategy.

Tabel 7. The Anova Calculation results of the Effect of Prior Knowledge Understanding Concepts

Tests of Between-Subjects Effects

Dependent Variable: NILAI PK (GPA SCORE)

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	176.497[a]	1	176.497	17.717	.000
Intercept	14872.497	1	14872.497	1492.927	.000
PA	176.497	1	176.497	17.717	.000
Error	846.767	73	9.962		
Total	15935.000	75			
Corrected Total	1023.264	74			

a. R Squared = 0.172 (Adjusted R Squared = 0.163)

H_0: There is no significant difference in the ability of understanding mathematical concepts among students with high prior knowledge and lower prior knowledge of linear functions.

H_1: There are significant differences in the ability of understanding mathematical concepts among students with high prior knowledge and lower prior knowledge of linear functions.

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Analysis of the test results are presented in Table 7. shows the test results showed the significance of 0.000, because the sig <0.05 means that H_0 is rejected, it showed no significant difference in the ability of understanding the concept of linear function between students with high prior knowledge and students with low prior knowledge.

DISCUSSION

The Effect of Learning Strategies on Understanding Concepts

Based on the research results revealed that there were significant differences in the ability of understanding the concept of linear function between classes with individual *blended learning* strategy and group *blended learning* strategy. Classroom learning with blended learning strategy group experienced a significant improvement compared to the class with individual learning blended learning strategies.

The Influences of Prior Knowledge to Understanding Concepts

The results showed that there were significant differences in the ability of understanding the concept of linear function between students with high prior knowledge and low prior knowledge. These results are consistent with previous studies conducted by (1) Kendeou & van den Brock (2008) who argued that prior knowledge affects the ability to understand, (2) Mujiyanto (2012) which concluded that there is a difference between the students' understanding of concepts that have formal reasoning high with students who have low formal reasoning, (3) Haripersad (2011) who found that prior knowledge is an important component to the conceptual and procedural understanding.

Interaction Effect of Learning Strategies, Prior Knowledge to Understanding Thed Concept of Linear Functions

Based on the available data it can be seen that there is an increase in posttest scores after students gain understanding of the concept of learning through *blended learning* instructional strategies. This suggests that the provision of appropriate learning strategies to improve student learning outcomes, especially in understanding the concept of a linear function.

According to the table presented above it can be seen that students are getting the process of learning with individual *blended learning* strategy had an average pretest score higher than students who received learning with blended learning instructional strategy group. However, the value of the opposite occurs when the student has been given the treatment, which is known from the post-test results that the average student with a group *blended learning* strategy to be higher than average students with individual *blended learning* strategy.

Blended learning instructional strategy in groups provide more opportunities for students to perform better in the search for prior knowledge that he/she has, through discussion and ask a friend in group. Learning model as a group are known to be superior in helping students who have difficulty learning and prior knowledge is low, because the learning model student groups can receive his colleagues with a variety of different backgrounds.

CONCLUSION

1. There is a significant difference to the ability of understanding mathematical concepts between classes with *individual learning blended* and *group blended learning* strategies.

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2. There are significant differences in the ability of understanding mathematical concepts among students with high prior knowledge and students who have lower prior knowledge of linear functions.
3. There is an interaction in learning strategies between individual blended learning and group blended learning, prior knowledge to the capabilities of understanding mathematical concepts of linear functions.

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