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The Influence of Learning Strategy and Self-Regulated Learning on the Ability of Vocational High School Teachers to Administer the Concept of a Network Operating System

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This study aims to examine: (1) the differences in the ability in administering the concept of a network operating system among the trained teachers in using online and blended learning strategies; (2) the differences of those between teachers with High Self-Regulated Learning (HSRL) and Low Self-Regulated Learning (LSRL); and (3) the interaction between the blended learning strategy and Self-Regulated Learning (SRL) for the trained teachers. This study uses a factorialised version of non-equivalent control group design. Its subjects are computer and a network engineering teachers of the Vocational High School, and the data were tested using two-way Anova. The results are: (1) there is a significant difference in the ability to apply the concept between teachers who are taught using online learning strategy and those using blended learning strategy, with the values of F = 9.763 and Sig = 0.003; (2) there is a significant difference in the ability to apply the concept between HSRL and LSRL teachers, with the values of F = 34.280 and Sig = 0.000; and (3) there is an interaction between the online and the blended learning strategy with SRL, with the values of F = 10.146 and Sig = 0.002. The advantage of this blended learning strategy is that the ability to support the concept is better than online learning with F = 9.763 and Sig = 0.003, the blended learning strategy that is suitable for technical learning is 30% face-to-face instruction and 70% online learning.

Key words: *Blended learning, Online learning, Self-regulated learning, Learning strategy.*

Introduction

Nowadays, learning using Intera net technology is commonly used. The application of Intera net technology is a form of revolution in learning (Rosenberg, 2001). By using Intera net, the trainees can learn anywhere and anytime; however, it needs not only a good learning system and learning management, but also a good learning strategy. A correct learning strategy will possibly be able to increase the ability in understanding certain concepts in the learning materials. Learning is an activity to facilitate a learning process toward the learners by providing learning sources. Several learning strategies are applied to maximise the learning outcomes. One of the learning objectives is to help the learners to understand the main concept in a subject, not merely to remember partial facts (Santrock, 2010). The understanding of a concept will be deeper and more meaningful when the teacher can help the learners explore the topic deeply and give a suitable and interesting example for a certain concept. Dunlap and Gabringer (1996) explain that someone who understands a certain concept is seen by his/her ability in articulating something by expressing opinion, perspective, and solution; being criticised and used by others (Alahdal & Al-Ahdal, 2019).

Implementing a concept is an ability of the learners in using a concept or an abstraction or things that have been previously learned in a new and real circumstance (Reigeluth, 1999). Implementing a concept based on Bloom taxonomy includes cognitive aspects in C3 level. Understanding a concept is related to conceptual knowledge or more complex one (for examples, classification, categorisation, generalisation, theory, model and structure), while implementation is the use of abstraction to solve a new problem (Anderson and Krathohl, 2001). Gardner (1999) explains that at least there are three factors that become the main barriers for learners to be able to understand and implement the learning outcomes in their daily life. The three factors are: (1) the selection of learning strategy (2) the curriculum substance, and (3) the inappropriate learning objectives formulation. Theoretically, in order to make the learning process run smoothly as well as to make the transfer of knowledge succeed, it is necessary to blend with a learning strategy. The learning strategy is a learning activity which must be done by both the teacher and the learners in order to reach the learning objectives optimally. The acquired learning outcomes will be influenced by the learning strategy and the learner's characteristics (Slavin, 2008). For Vocational High School teachers, there has been measurement in learning gains through a test namely *Uji Kompetensi Guru* (Teacher's Competence Test). The next step after the teachers being tested is that the learning activity is done through training. The training conducted before 2015 by the Centre for Developing and Empowering Teachers and Educational Personnel namely PPPPTK, used face-to-face instruction strategy. The problem is that when the training uses such strategy, its cost is high and it cannot accommodate all of the teachers to be trained in the training organiser. To solve the problem, the strategy of training is modified into online and blended learning (Hasibuan et al., 2019).

Teachers have a very crucial role and duty to improve the nation's intelligence. To do so, they need to improve their professionalism continuously; one of the efforts is by the teacher learning program called *Guru Pembelajar* (Kemdikbud, 2016). It is such a very important activity for the teachers' self-development. The fact that the number of teachers in Indonesia is so large and widely spread around Indonesia makes it impossible to use face-to-face training as the suitable approach for the teachers' self-development (Kemdikbud, 2016). Therefore, the Directorate General of Teachers and the Educational Personnel (Ditjend GTK) makes use of Information and Communication Technology (ICT) for the *Guru Pembelajar* program. Through this system, it is expected that all of the teachers can actively access the learning source, learn individually as to their own needs, and share their experiences to other teachers (Kemdikbud, 2016).

The results of previous studies on blended learning generally show that the use of this strategy will succeed in: (a) assisting the learners to learn more independently at their own pace, (b) learner-centred, and (c) assisting the achievement of learning objectives (Graham, 2006; Voos, 2003; Dziuban et al., 2004). The success of blended learning in improving the learning outcomes, based on several literatures, is because in blended learning there are various combinations of media, technology, activity and learning events which can bring in solutions to the needs of learners who have various characteristics (Bersin, 2004; Harding, 2005; Cheung and Hew 2011).

The complex knowledge can also be taught online if the learning environment is designed based on the consideration of the pedagogy on learners, the learning process and suitable learning content (Morisson, 2003). The quality of learning is related to the use of learning strategy to achieve the objectives in a certain learning condition (Degeng, 2013). The learning should also be oriented to make the learners comprehend, so it needs a correct and effective learning strategy in the learning process (Setyosari, 2015).

Blended learning is a strategy which is effective in the learning outcomes, and its score is high in the students' and teacher's satisfaction assessment (Dziuban & Moskal, 2004). Blended learning is often called hybrid learning, which combines face-to-face teaching and web-based learning methods, so it needs a suitable learning strategy. If the learning is well implemented by using resources and learning facilities, it will be effective. The studies conducted by Graham (2003) and Dziuban et al. (2004) show that the blended learning strategies have: (a) assisted the learners to learn independently, (b) changed the teacher-centred paradigm into the student-centred one, and (c) reached the learning objectives. To get optimal results in blended learning strategy, the teacher must possess sufficient knowledge and skills on learning strategy as well as understand the learners' characteristics. By understanding the learners' characteristics, the teacher can prepare appropriate learning materials.

Blended learning will combine face-to-face learning and online learning, and it grows rapidly. It enables: (1) to shift the teacher-centred paradigm into the student-centred one, (2) to increase the interaction between the students and the teacher or other learning sources, and (3) the convergence between various learning media, learning source, and appropriate learning environments. In blended learning strategy, the learning object (either online or offline) needs to be considered because the learners will interact more with such learning object. The blended learning strategy needs a management of their own in their study, which is called Self-Regulated Learning (SRL). SRL is a learning model which gives an autonomy for the learners to manage their learning effectively, so they will get maximum results. According to Zimmerman (2002), SRL is a process of a learner to activate and stimulate cognition, behaviours, and affect systematically to reach the learning objectives. Based on the social cognitive perspective, a learner can be called a self-regulated learner when he/she is metacognitively, motivationally, and behaviourally active in his/her learning process.

Methodology

The study uses quasi-experimental design which is the development of true experiment method involving two groups. The experiment group uses online learning strategy, while the control group uses blended learning strategy. The moderating variable used is Self-Regulated Learning (SRL), and the number of each sample is 34 respondents. The study uses two instruments: (1) the instrument to measure SRL, and (2) the instrument to measure the ability to implement the concept of administering the a network operating system. There are three variables being tested: (1) independent variable is the learning strategy consisting of two dimensions (online and blended learning); (2) moderating variable is SRL which has two dimensions (high and low); and (3) dependent variable is the ability to implement the concept of administering a network operating system.

The study is conducted in three stages. They are: (1) pre-experiment stage, (2) experiment stage, and (3) post-experiment stage. The technique used in data analysis in this study is 2-way Anova.

The Results Of Study And Discussion

Data Description

After the data are collected from the respondents, the data are analysed as shown in the following table 1.

Table 1: Data of Measurement Result

Strategi Pembelajaran	Self Regulated Learning	Mean	Std. Deviation	N
Online Learning	Tinggi	74.3529	5.01175	17
	Rendah	71.7647	3.56247	17
	Total	73.0588	4.47851	34
Blended Learning	Tinggi	80.4706	3.87488	17
	Rendah	71.7059	3.33100	17
	Total	76.0882	5.69619	34
Total	Tinggi	77.4118	5.39426	34
	Rendah	71.7353	3.39615	34
	Total	74.5735	5.30929	68

Based on Table 1, the mean score of the ability to implement the concept of administering a a network operating system of the teachers being trained using online learning strategy is 73.058, and its deviation standard is 4.478. The mean score of the ability to implement the concept of administering a a network operating system of the teachers being trained using blended learning strategy is 76.088, and its deviation standard is 5.696. The ability to implement the concept of administering a a network operating system of the teachers being trained using online learning strategy and having high SRL has the mean score of 74.352, and its deviation standard is 5.011. While the mean score of the teachers having high SRL and being trained using blended learning strategy in the ability to implement the concept of administering a a network operating system is 80.470, and its deviation standard is 3.874.

Prerequisite Tests (Normality and Homogeneity)

The data normality test is conducted as the data grouping based on the post-test scores for both groups of teachers, both online learning and blended learning. The data normality test is shown below.

Table 2: Result of Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Post_Test_Online_Learning	.135	34	.120	.949	34	.116
Post_Test_Blended_Learning	.129	34	.162	.946	34	.090

a. Lilliefors Significance Correction

Based on table 2, the significance scores of Kolmogorov-Smirnov for the ability to implement the concept of administering a a network operating system using online learning and blended

learning are 0.120 and 0.162 respectively. Since both of them have the significance score >0.05, the results of post-test of both learnings are normally distributed. Based on the data normality test that both of them are normally distributed, the 2-way Anova test can be conducted. The homogeneity test of samples' variances is conducted using Levene's test with 0.05 significance level. If the significance level is bigger than 0.05, it is concluded that the variances across groups are homogeneous. The result of the homogeneity test using Levene's test using SPSS program is shown in the following table.

Table 3: The Variances' Homogeneity Test across Groups

Levene's Test of Equality of Error Variances[a]

Dependent Variable: Pos_Test

F	df1	df2	Sig.
1.576	3	64	.204

Based on table 3, the variances of these four groups are homogeneous. It is proven by the F score equals 1.576 and the significance level is 0.204. Both scores statistically indicate that the variances of post-test scores on these four groups are homogeneous.

Statistical Test

The test is conducted to prove statistically on the tested data as shown in the table 4 below.

Table 4: Result of 2-Way Anova Test

Tests of Between-Subjects Effects

Dependent Variable: Pos_Test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	865.926[a]	3	288.642	18.063	.000
Intercept	378162.368	1	378162.37	23665.06	.000
Strategi_Pembelajaran	156.015	1	156.015	9.763	.003
Self_Regulated_Learning	547.779	1	547.779	34.280	.000
Strategi_Pembelajaran * Self_Regulated_Learning	162.132	1	162.132	10.146	.002
Error	1022.706	64	15.980		
Total	380051.000	68			
Corrected Total	1888.632	67			

a. R Squared = .458 (Adjusted R Squared = .433)

Based on the analysis result as shown in table 4 above, it shows that all sources have the significance <0.005.

Discussion

Based on the results of data analysis and the Anova test shown in table 4, there is a difference in the ability to implement the concept of administering a a network operating system of the teachers being trained using online learning and blended learning strategies. From the calculation of the descriptive test, the teachers being trained using blended learning strategy have higher mean scores compared to those being trained using online learning strategy. It means that the implementation of blended learning strategy has greater influence on the ability to implement the concept of administering a network operating system than the implementation of online learning strategy. This finding proves that the group using blended learning strategy is more effective than the group using online learning strategy (Graham, 2006; Osguthorpe and Graham, 2003).

The blended learning strategy is superior, especially in the training of administering a a network operating system since it combines the use of learning media in the delivery of learning (Graham, 2006). Another factor which makes the ability to implement the concept of administering a a network operating system using blended learning strategy superior, is due to the fact that the teachers (trainees) get direct explanation from the trainer during face-to-face sessions in the classroom, increasing their conceptual knowledge (Arends, 2012). In the learning using blended learning strategy, there is a balance between online access for cognitive field and the element of pedagogical interaction through face-to-face sessions in the classroom (Graham, 2006).

The involvement of the teachers (trainees) in accessing the learning materials can be done anytime and anywhere as long as they connect to the Intera net since the learning contents are available in online version. The result of the study also supports the other studies related to the impact of blended learning toward the students' active involvement (Dziuban, 2004). It also shows that the blended learning strategy has a higher success rate compared to the online learning strategy (Dziuban et al., 2006). The blended learning strategy can increase the understanding of key concepts in basic calculus subjects (Ma, 2010). Dziuban et al. (2004) state that a blended learning strategy is a pedagogical approach which combines effectiveness and social interaction, so it enables an active learning in both online learning and face-to-face learning.

The learning events which take place in this study are collaboration and social interaction among the learners through information sharing, discussion, and cooperation. It is suitable to the theory of Vygotsky that both learning strategies are equipped with the facilities in

information sharing, discussion, and cooperation. This theory is strengthened by Bruner (1996) that the activities of information sharing, discussion, cooperation, and social interaction need to be applied in the learning process.

Based on table 4, there is a difference in the ability to implement the concept between the teachers who have high SRL and those who have low SRL. Descriptively, it also shows that the teachers who have high SRL have higher mean scores compared to those who have low SRL. Therefore, SRL influences the ability to implement the concept of administering a a network operating system. The result of the study is comparable to the previous study conducted by Paris et al. (2001), which concludes that the students who are able to regulate themselves in their learning process will gain high academic achievement. High SRL will also influence the students in accessing the information in both online learning and blended learning strategies. In other words, high SRL will support the students' achievement (Orhan, 2007).

Learning is not only influenced by external motivation, but it is also influenced by internal motivation as well as SRL (Chung, 2002). When the learners learn, they should be active, constructive, and able to regulate themselves correctly and well (Montalvo et al., 2004). The students who have high SRL will have high motivational and metacognitive levels. Those who have high metacognition will be able to plan well, regulate themselves well, and organise and evaluate themselves during the learning process (Zimmerman, 2004).

In Information and Communication Technology (ICT), the study conducted by Kramarski et al. (2006) shows that SRL is very efficient in increasing the learning achievement. Zumbrun et al. (2011) even state that SRL is a very important factor in increasing the academic achievement as well as the learning motivation. In this process, the students independently can plan, monitor, and access their learning online as well as evaluate themselves when the learning is over.

There is an interaction between learning strategy and SRL toward the ability to implement the concept of administering a network operating system. The interaction between these two variables shows that the variables of learning strategy and SRL have a strong influence toward the ability to implement the concept of administering a network operating system. The interaction can take place when the independent variable and the dependent one bring effects together and are strengthening each other. The interaction can also take place when more than one independent variable brings significant effects. This factor may happen due to the more dominant online portion compared to the face-to-face portion in blended learning strategy.

In this study, it is concluded that the blended learning strategy provides a significant influence toward the ability to implement the concept of administering a network operating system by considering SRL. Besides, SRL also gives an influence toward the ability to implement the concept of administering a network operating system by considering the learning strategy.

The reason why there is an interaction between the learning strategy and SRL in this study is because each variable has a strong influence toward the ability to implement the concept of administering a network operating system. The blended learning strategy has a significant influence toward the ability to implement the concept of administering a network operating system because there is an interaction among the learning teachers through the discussion forum available in the learning management system. Moreover, during the face-to-face classroom session, the learning teachers can also interact with the trainer/facilitator of the training which creates a psychological intimacy between the facilitator and the learning teachers as well as among the learning teachers. Several materials or exercises which have not been fully understood during online learning can be discussed with the facilitator or among the learning teachers through blended learning strategy.

To increase the conceptual knowledge, there is a combination between online, offline, and face-to-face sessions in the blended learning strategy (Arends, 2012). During offline sessions, the materials can be learned by the learning teachers in the forms of flipbook files, videos, power points, and PDF files. Besides these four files, online sessions provide web-based materials which can be accessed anytime and anywhere as long as the teachers are connected to the Internet. These materials are compiled from the reorganised modules which are similar to the learned modules during face-to-face sessions. However, the contents are customised in order to make it easily understood and interesting for the teachers. Having the materials combined and customised in line with the maturity level of the learning teachers, the learning can be more independent and collaborative, which eventually increases the comprehension on what is being learned (Chang et al., 2008).

The connectivism learning theory is also applied in these online learning and blended learning strategies. The phenomenon of Massive Open Online Courses (MOOC) is one of the applications of the connectivism theory (Siemens, 2005; Downes, 2010). The training which uses MOOC platform gives the biggest opportunity to anyone who wants to register for learning and to share information online. The duty of the facilitator or *widyaiswara* is simply a guide since most of the participants are responsible in the materials being learned and shared among the trainees compatible with the characteristics of adult education (andragogy).

Constructivism is a learning theory, pedagogy, and andragogy which is very important to be applied into a learning process (Paurelle, 2003). It also focusses on the socio-cultural learning aspect and how the environment and the people are involved in the learning process. It is compatible with the social constructivism theory by Vygotsky (Schifter & Cipollone, 2013).

SRL has a strong influence toward the ability to implement the concept of administering a network operating system. The trainees or teachers who have high SRL will be able to regulate themselves optimally, to be more motivated, and eventually to implement a correct and good

concept if they are supported by a suitable learning strategy. A learning strategy which is suitable with the trainees' condition will make the learning more effective and more efficient. Some elements which can make the learning more effective are: (1) the strategy to determine the learning objectives; (2) the time to apply the strategy; and (3) the evaluation on the effectiveness of the learning strategy (Gagne, 1985). Someone who cannot regulate himself/herself well will possibly get a poor academic result despite his/her high cognitive ability. The cognitive ability of the trainees or teachers is related to the learning process, the pace of understanding the training materials, as well as the knowledge gained of such materials (Love et al., 2005). SRL also plays a very significant role in the aspect of ability in using information technology (Kramarski et al., 2006).

Based on the study, the blended learning is a variation of learning strategy which combines online learning and face-to-face learning. The combination can be customised toward the characteristics of the trainees including the ICT literacy, the supporting facilities/infrastructures, and the policy of related stakeholders in order to enable the achievement of optimal learning objectives.

Conclusion

From the study, first it can be concluded that there is a difference in the ability to implement the concept between the teachers being trained using online learning and blended learning strategies, with the values of F=9.763 and Sig=0.003. The use of blended learning strategy is significantly superior compared to online learning. It means that the learning strategy significantly influences the ability to implement the concept for the teachers. Second, there is a difference in the ability to implement the concept between the teachers who have high SRL and those who have low SRL, with the values of F=34.280 and Sig=0.000. The teachers who have high SRL have a higher ability to implement the concept than those who have low SRL. Third, there is an interaction between the online learning and blended learning strategies and SRL in the ability to implement the concept of administering a network operating system, with the values of F=10.146 and Sig=0.002. The blended learning strategy is suitable to be used for the training for vocational teachers that combines online learning and face-to-face learning. It means that the addition of both SRL and the learning strategy strongly influences the gained ability to implement the concept of administering a network operating system.

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