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Implementation of Blended Learning to Use Discovery Learning Method

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The focus of this research is to find out how to implement blended learning in university and how much influence it has on calculus I learning outcomes with the discovery learning method. The method used in this research is quasi-experimental, with a non-equivalent pre-test/post-test control group design. From the research of students' Implementation of Blended Learning using Discovery Learning Method in Calculus I Courses, it has the result of the extended score between X_{max}(highest score) = 85 until X_{min} (lowest score) = 45 in the total sample of 30 students. The mean ($\bar{X}$) is 66.10 ; variant (s^2) is 92.73 and standard deviation (s) is 9.63. The results of this study indicate that there is a positive influence of blended learning to use discovery learning models in the calculus I course. From the computation of the experiment and control class by using the t-test, it is found that $t_{observed}$ = 1.8. While insignificant level of α = 0.05 and df (30+30-2) = 58, found that $t_{table(1-\alpha;(58))}$ = 1.67. Because $t_{observed}$ = 1.8 > $t_{table(1-\alpha;(58))}$ = 1.67, it means that research hypothesis (H_0) is rejected and (H_i) is accepted. So, it can be stated that there is a significant influence of the Blended Learning to use Discovery Learning Method in the Calculus I Course.

Keywords: *Blended Learning, Discovery Learning, quasi-experimental*

Introduction

As a lecturer, we are required to do tri dharma of higher education, namely: teaching, researching, and serving at the same time. This condition makes us have to be good at managing time. In line with that, we need a teaching system that is flexible and can facilitate us in delivering material without having to be in the classroom. In America, online learning has long been applied to simplify the learning process. The expected learning system can only be obtained with the help of technology. New technology is drastically changing the conditions in which teaching and learning are conducted, and this is also true for higher education. The technology used outside the classroom to deliver content is an efficient way to prepare students for classroom activities and increases the class time available for student-

centred active teaching. This pedagogical strategy could help traditional bricks-and-mortar Universities to add value to face to face interaction in a digital world (Bowen, 2012; Nanclares & Rodríguez, 2016).

Nowadays, abundant online resources make blending the teaching process possible and move content coverage outside the classroom, to spend in-class time to promote high order thinking skills. Therefore, generally speaking, Blended Learning can be understood as an online activity blended with classroom-based delivery. It is a comprehensive definition that embraces different types of blended learning experiences, abundantly developed lately in all levels of education. As a result, a terminology confusion arose between the terms hybrid, mixed, flipped, and inverted. All these are inconsistently defined in the literature, creating a barrier to efficient research on and implementations of these types of classes (Margulieux, Bujak, McCracken, & Majerich, 2014; Nanclares & Rodríguez, 2016).

In America, online learning has long been applied to simplify the learning process. Online learning is a form of distance learning or distance education, which has long been a part of the American education system, and it has become the largest sector of distance learning in recent years (Bartley & Golek, 2004; Evans & Haase, 2001; Nguyen, 2015). For this literature review, both hybrid or blended learning and purely online learning are considered to be online learning, as much of the literature compares these two formats against the traditional face-to-face. Exclusively online courses are courses delivered entirely over the Internet, and hybrid or blended learning combines regular face-to-face classes, learning over the Internet, and learning supported by other technologies (Bliuc, Goodyear, & Ellis, 2007; Boticki, Hoic-bozic, & Budiscak, 2009; Nguyen, 2015; Osguthorpe & Graham, 2003).

In line with it, Al-Qahtani said study blended learning took the form of a combination of face-to-face classroom teaching with lecture and class formats and the use of an asynchronous online classroom. The students had to attend classes in person, but also had access to an asynchronous online classroom to undertake a range of learning activities based on their grades. These included enhancing their knowledge through additional reading and through browsing relevant linked websites, with other activities such as self-assessments, exercises, and group tasks and structured discussions (Al-Qahtani & Higgins, 2013).

Blended Learning does not mean bolting technology onto a traditional course and/or using technology as an add-on to teach a difficult concept or deliver supplemental information. Blended Learning should be viewed as an opportunity to redesign the way that courses are developed, scheduled, and achieved in higher education through a combination of physical and virtual instruction, that is bricks and clicks (Bleed, 2001; Medina, 2018). Blended Learning also surpasses barriers of time and place and can have a direct positive influence on students' learning outcomes when compared with traditional teaching (Chen & Jones, 2007; Medina, 2018; Melton, Graf, & Chopak-Foss, 2009). Though several researchers have

observed that this latter characteristic depends heavily on student satisfaction with the development and completion of the course (Chang & Fisher, 2001; Medina, 2018). Therefore, student satisfaction is one of the factors that can be gauged to determine whether Blended Learning has been effective or not (Holland, Kaplan, & Sams, 1995; Kintu & Zhu, 2016; Medina, 2018; Rienties & Toetenel, 2016; Shantakumari & Sajith, 2015; Waheed, Kaur, & Kumar, 2016). Based on this opinion, we can know that blended learning is a learning model that combines traditional aspects (face to face) and the use of technology for distance learning in the learning process. This activity allows us to meet the meeting requirements set by the college, even though we don't have to be always present in class. So the learning process becomes more flexible with blended learning.

Over the last decade, blended learning has been growing in demand and popularity in higher education and has become a widespread teaching phenomenon. It becomes increasingly evident that blended learning can overcome various limitations related to online learning and face-to-face instruction. A meta-analysis of more than 1,100 empirical studies published between 1996 and 2008 concluded that blended learning proves to be more effective than either online learning or face-to-face instruction (Alammary, Sheard, & Carbone, 2014; Means, Toyama, Murphy, Bakia, & Jones, 2009). For many researchers, it is almost sure that blended learning will be the new traditional model for course delivery in higher education (Alammary et al., 2014; Norberg, Dziuban, & Moskal, 2011; Ross & Gage, 2006). The question now is not whether to blend or not, it is how to design an effective blend (Alammary et al., 2014).

The literature shows that blended learning courses are designed in many different ways, ranging from adding extra online activities to a traditional face-to-face course to building the whole blended learning course from scratch. There is a lack of a single accepted definition for the term blended learning (Alammary et al., 2014; Deperlioglu & Kose, 2013; Graham, 2013; Lee, Fong, & Gordon, 2013; Stacey & Gerbic, 2008). This causes teachers to understand blended learning in different ways and then design their courses according to their understanding of the concept. With a large number of mixed learning designs, selecting the most appropriate design approach is becoming a significant challenge, especially for teachers who lack the necessary theoretical preparation and experimental experience with blended learning, which is the case of the majority of teachers in higher education (Alammary et al., 2014; Huang & Zhou, 2006).

Although, extensive academic research has proposed and discussed several blended learning design approaches (Alammary et al., 2014; Boyle, Bradley, Chalk, Jones, & Pickard, 2003; Garrison & Vaughan, 2008; Hoic-Bozic, Mornar, & Boticki, 2008; Huang & Zhou, 2006; McCarthy, 2010; Newcombe, 2011).

The next challenge is that not all skills can be learned via e-learning, nor is it possible to deliver all educational content via remote means. Consequently, individuals may feel the need to meet and communicate with each other face-to-face to engage in open interactive debates, share their ideas, and challenge each other. For this reason, blended learning approaches have emerged, where technology-supported education is combined with more conventional educational schema (Berke & Wiseman, 2003; Wakefield, Carlisle, Hall, & Attree, 2008). Recently there has been a move towards merging technologies and educational techniques designed to support different forms of teaching to achieve more effective learning. Blended learning is defined as the ‘‘effective integration of various learning techniques, technologies, and delivery modalities to meet specific communication, knowledge sharing, and informational needs’’ (Finn & Bucceri, 2004; Wakefield et al., 2008).

Similarly, Whitelock & Jelfs (2003) argue that blended learning should integrate and combine traditional learning methods with e-learning approaches. For this reason, blended learning needs to make use of a variety of media as part of an e-learning environment while simultaneously exploiting additional educational avenues such as inquiry-based learning (Kubieck, 2005; Wakefield et al., 2008). Consequently, blended learning needs to be structured in such a way as to take account of both the type from learning adopted and the educational approaches selected (Wakefield et al., 2008; Whitelock & Jelfs, 2003).

One of the problems that occur in education, especially in science subjects, is the weakness of the learning process. Students are not encouraged to discover the knowledge themselves, but students are required to remember what teachers have given them. As a result, students are unable to provide solutions to problems that arise, especially if the problem is related to the concept of IPA. For students themselves the science lesson is an unpleasant lesson because it is full of formulas and must be memorised, resulting in many students who get low learning results to reach the established limit of mastery. Based on the above, science learning is expected to provide direct experience to understand science scientifically. Learners can achieve the expected learning results by experiencing direct knowledge — one way to involve students directly in understanding IPA by applying the discovery learning model. The discovery learning model is one of the learning models that can answer the educational needs of the 2013 curriculum is a scientific approach. Discovery learning is the method that when the teacher does not give the final material, and students must organise their content with the stimulus provided by the teacher. The teacher is a guide in the process of learning, and the teacher offers the students occasion to be active students (Feriyanti, 2014).

According to Ratu beta in her journal, cite form kunsting and friend, said if Discovery learning is learning where students learn to find the concept independently (Khabibah, Masykuri, & Maridi, 2017; Kuensting, Kempf, & Wirth, 2013; Rudibyani, 2018). The discovery learning model enables students to play an active role in the learning process by answering and solving problems to find a long-lasting and memorable concept (Maarif, 2016;

Meador, 2005; Rudibyani, 2018). Thus the discovery learning model is expected to be used to train students to think critically (Rudibyani, 2018).

Methods

This study was carried out using a pre-/post-test design with a control group. This was to identify as far as possible a causal relationship between the modes of delivery and learning outcomes, as much of the experimental literature comparing distance e-learning with face-to-face teaching cannot adequately control for differences such as student motivation at registration and throughout the course (Al-Qahtani & Higgins, 2013; Cornell & Martin, 1997).

The method used in this research is quasi-experimental, with a non-equivalent pre-test/post-test control group design. Class A is an experimental class (using blended learning trough the discovery learning model), and class B is a control class (using lecture learning models). Both levels get a pre-test before receiving treatment and later by giving a post-test (Rudibyani, 2018).

The population in this research is the students of undergraduate students at Universitas Muhammadiyah Prof.DR.HAMKA. There are two classes, and the number of students is 60. The class used as the sample A-class, which consists of 30 students as experiment class and used B-class, which includes 30 students as a control class.

Results and Discussion

From the research of students' Implementation of Blended Learning using Discovery Learning Method in Calculus I Courses, it has the result of the extended score between X_{max}(highest score) = 85 until X_{min} (lowest score) = 45 in the total sample of 30 students. The mean ($\bar{X}$) is 66.10 , variant (s^2) is 92.73 and standard deviation (s) is 9.63.

From the distribution table of students' blended learning using the discovery learning method above can be made a histogram and polygon chart of the students' blended learning in the experimental class.

From the picture 1 and 2, it can be seen the difference between the experimental class and the control class. The experimental class got better learning outcomes than the control class. The experimental class receives the average value of 66.1, while the control class gets 56.9.

From the research data of frequency distribution table, it is found that the average score in experiment class ($\bar{X}$) = 66.1 and variant (s^2) = 92.73

From the computation of the experiment and control class by using a t-test (appendix 3), it is found that $t_{observed}$ = 1.8., while insignificant level of α = 0,05 and df (30+30-2) = 58, found that $t_{table(1-\alpha;(58))}$ = 1.67. Because $t_{observed}$ = 1.8 > $t_{table(1-\alpha;(58))}$ = 1.67, it means that research hypothesis (H_0) is rejected and (H_i) is accepted. So, it can be stated that there is a significant influence of the Blended Learning to use Discovery Learning Method in the Calculus I Course.

Conclusion

The implementation of Blended Learning to use Discovery Learning Method in the Calculus I Course still needs to be improved in terms of information systems, and the selection

of teaching methods must be considered so that the learning process with the blended learning model can take place appropriately.

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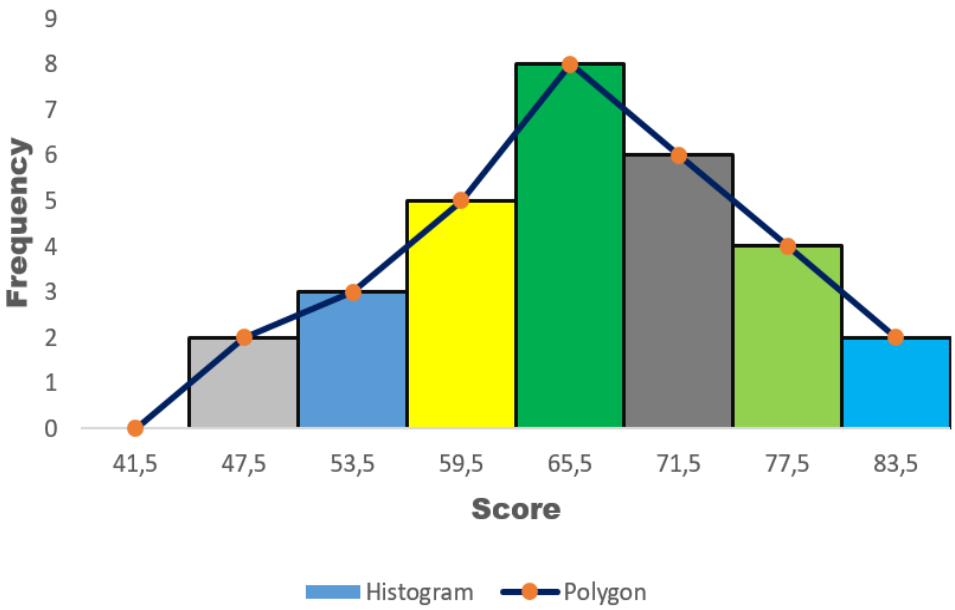

Figure 1. Histogram and Polygon Chart of Students' blended learning to use discovery learning method in Experiment Class

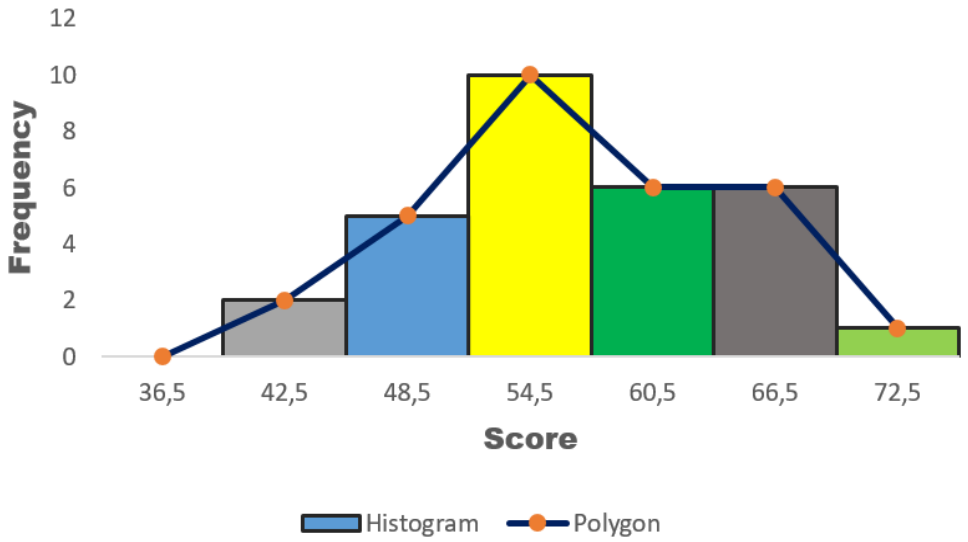

Figure 2. Histogram and Polygon Chart of Students' blended learning to use discovery learning method in Control Class

Table 1. Pre-test value on calculus I course

Statistic	Symbols	Experiment Class	Control Class
Total Individual	n_1 .n_2	30	30
Mean	X_1 .X_2	50.7	50.3
Variance	s^2	53.13	51.48
Standar Deviation	s	7.29	7.17

Table 2. Post-test value on calculus I course

Statistic	Symbols	Experiment Class	Control Class
Total Individual	n_1 .n_2	30	30
Mean	X_1 .X_2	66.1	56.9
Variance	s^2	92.73	58.59
Standar Deviation	s	9.63	7.65

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