The Influence of Hybrid Learning Models on the Conceptual Science Education of Elementary School Teachers

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The rapid development of digital technology in the twenty-first century has impacted learning and teaching. It allows learning anywhere, anytime and with anyone. Hybrid learning can accommodate such systems. This study examines how the Hybrid Learning Model affects prospective elementary school teacher candidates' understanding of science education concepts. The research subjects were studying to become elementary school teachers. They were divided into two groups, with 35 students in the experimental group and 35 students in the control group. Analysis of Variance One Way was used. The hybrid learning model was shown to significantly improve student learning outcomes, in elementary school teachers' understanding of science education concepts.

Key words: *Learning model, hybrid learning, learning outcomes, primary school teacher education.*

Introduction

Practising and prospective teachers must prepare themselves for the twenty-first century and be more professional in carrying out teaching assignments. Furthermore, twenty-first century teachers not only master teaching content but must also be able to integrate technology into their teaching (Jan & Jrf, 2017). The new paradigm of the twenty-first century is a shift in the classroom environment, from a teacher-centred learning environment to student-centred learning (Wismath, 2013). Learning models that can facilitate the characteristics of learning styles, students and teacher teaching strategies and methods, are part of online learning. Online learning is flexible. It can occur anytime, anywhere, by anyone, and through anything. Among other learning styles it combines hybrid-face learning with online learning. Importantly, hybrid learning integrates electronic learning and traditional learning with its platforms (Hutchison & Mitchell, 2008). With limited time, it can accommodate and facilitate the learning of science concepts not thoroughly learned in traditional class or face to face. Hybrid or blended learning combines three formats; namely (1) Asynchronous-without presence with face-to-face / physical presence; (2) Asynchronous-without presence with synchronous-virtual presence; and (3) virtual presence with physical presence (Michel, 2008). Hybrid learning combines online learning with regular and effective face-to-face learning (Boyle, et al., 2003, Dowling, et al., 2003, Vaughan, 2007, and William, et al., 2008).

Strengths

Hybrid learning can improve student performance and retention, giving them more time flexibility, availability of several learning modes, a deeper sense of community and greater interaction (Brunner, 2007). That hybrid learning impact learning is supported by Campos and Harasim's research in (Buzzetto-More & Sweat-Guy, 2006), (Melton, B., Helen, G., & Joanne, 2009) and Bawaneh (2011), where students are more happy and active when using hybrid learning, and more motivated (Collis, 2003). Hybrid learning strategies also allow students to learn basic information outside of class time, thereby freeing class-time for the conceptual understanding of material (Prunuske, Batzli, Howell, & Miller, 2012).

Empirical research results show that the learning model used in science is still conventional. It involves a direct delivery model using lectures, and question and answer methods. Less time is allocated for students (prospective teachers) to understand more deeply about science learning materials, where there is only 100 minutes per meeting. There is not enough time, if learning is only face-to-face, in class, requiring online classes to deepen learning. Hybrid learning offers a solution. It can accommodate the needs of students and teachers in the science learning process. Science teachers in elementary schools are required to fully understand their learning concepts, including pedagogical concepts about the use of models,

and strategies and approaches based on information and communication technology, before applying them to teach science in elementary schools. This subject is one of expertise that must be influenced by prospective teachers. Where competencies are expected through science learning courses, students can master the basic principles of teaching science learning. Achieving these competencies requires an appropriate learning model that can support the achievement of learning objectives, to achieve student learning outcomes of elementary school teacher education.

This research focuses on the outcomes of understanding concepts. Understanding includes building meaning from oral, written, and graphic messages through interpreting, modelling, clarifying, summarising, comparing and explaining (Anderson and Krathwohls, 2001). Understanding is a mental process involving the adaptation and transformation of knowledge (Gardner, 1999b). Someone can be said to understand if he or she can show performance at a higher level of ability (such as application, analysis, synthesis, and analysis) in both the same context and different contexts (Willis, 2000). Learning outcomes in understanding concepts, in this context, are the results achieved by students after following the learning process within a certain period contained in the concept understanding test. That includes cognitive abilities on intellectual skills; understanding concepts as a category of principles and theories. Santrock (2010) explains that one learning objective is helping students understand the main concepts in a subject, rather than just remembering separate facts. Understanding of the concept will be deeper and more meaningful, if an educator can help learners to explore a topic in-depth and give appropriate and interesting examples in accordance with certain concepts.

Based on literature studies and empirical research, this study will look at whether there are differences in the learning outcomes of science learning students in elementary school teacher education, taught through hybrid learning models Type 1 and Type 2. This research hypothesises differences in the learning outcomes of students understanding the concepts of science learning, as taught using Type 1 learning models and hybrid learning models with Type 2.
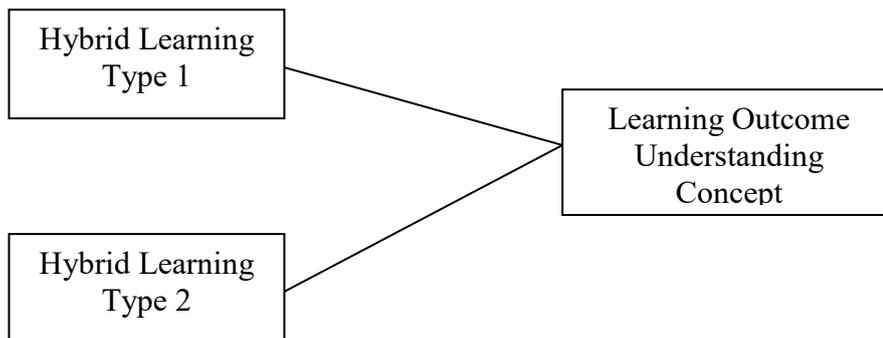
Method

The experimental design in this study uses the 2 x 2 *factorial version of the non-equivalent control group design* (Tuckman, 1999). The independent variable in this study is the hybrid learning model which is divided into hybrid learning with Type 1 (asynchronous + face-to-face attendance) and hybrid learning type 2 (asynchronous + virtual presence). The dependent variable is the result of learning to understand the concept of science education. The subject of research is students majoring in teacher education, at the primary

school of the state university of Manado, in two groups; (1) an experimental group of 35 students, (2) a control group of 35 students.

Figure 1. Research design

Asyncronous + Face to face

Asyncronous + Virtual

The experimental group used the hybrid learning model Type 1 and the control group used the hybrid learning model Type 2. The hybrid learning model Type 2 used the 'Moodle' application as a medium for presenting learning material, assigning and evaluating. The research procedure as based on two learning strategies is in Table 1.

Table 1: Steps of the Hybrid Learning model

Step	Hybrid Learning Type 2	Hybrid Learning Type 1
1	Introduction: Self-registration and introduction to material through Moodle displayed in a shared class.	Introduction: Face-to-face manual registration and introduction of material through power point slides by lecturers.
2	Core Activity: Searching for Material with *Self-Paced Learning in Moodle*	Core Activities: Presentation of material by lectures using power points.
3	Guided Exercise: *Online Collaborative Learning* (between students, and between students and lecturers)	Guided exercises: Individual exercises and group discussions in the classroom
4	Conclusion : *face to face* feedback through *online discussion forums via Moodle or WhatsApp*	Conclusion: Face-to-face feedback
5	Independent training online	Mandiri training via e-mail, WhatsApp
6	Evaluation: online assessment	Evaluation: Online assessment

Research Instruments and Data Analysis Techniques

The instrument was used to measure the research variables that became the main analysis, namely the learning outcomes instrument that measures understanding of concepts. The learning instrument to understand concepts is made in the form of multiple choice tests. The test questions are based on the learning content of elementary school teacher education science education courses that refer to the Indonesian national curriculum framework (KKNI). Before learning outcomes instruments are used, they are first validated by content learning experts who have expertise in the field of science learning, specifically for elementary school teacher education. 'Analysis of Variance' (ANOVA) techniques were used on data.

Findings

The average value of the learning outcomes of the application of the concept of learning science in groups treated with Type 1 hybrid learning models, and groups treated with Type 2 hybrid learning models are presented in Table 2.

Table 2: Observation of average learning outcomes of understanding concepts

Learning model	average	Lowest	The highest	St.dev
Hybrid Type 1	52.73	17	77	12.59
Hybrid Type 2	77.76	50	100	12.74

Based on the data above, the learning outcomes of the understanding of science learning concepts in groups with Hybrid Type 2 learning models have an average value of learning outcomes of 77.76 (standard deviation of 12.74). That is higher than the learning outcomes of the understanding of science learning concepts in groups with Type 1 learning models, which is 52.73 (standard deviation 12.59).

Based on the observation table of the average learning outcomes of understanding the concepts of science learning above, it can be seen that giving different learning models to students can have different effects on the learning outcomes of the understanding of science learning concepts, in groups with Hybrid Type 2 and Hybrid Type 1 learning models. Understanding the concept of science teaching in the group with learning model Hybrid Type 2 indicates higher than the learning outcomes of understanding the concept of science teaching in the group with learning model Hybrid Type 1.

Shortly, data on the effect of the Hybrid Type 2 and Hybrid Type 1 learning models, on the learning outcomes of the understanding of science learning concepts, are analysed below. But

first it is necessary to fulfill the assumption of data normality with the *Kolmogorov-Smirnov Goodness of Fit Test* of the observed variables. Normality test results show that the significance value obtained is p> 0.05. Therefore all data have a normal distribution.

Table 3: Normality Test Results *(Kolmogorov-Smirnov)*

	Statistics	Sig value
The value of learning outcomes understanding the concept of learning science (post-test)	0.921	0 .364

Based on the normality of data as substantiated by the Kolmogorov-Smirnov test, the learning outcome data regarding understanding of the concept of learning science, has a significance value of 0. 364 (p> 0.05). Therefore it can be concluded that the variable data follow a normal distribution. Thus it can be tested with ANOVA.

Univariate Analysis of Variance (Univariate ANOVA)

A hypothesis determined through H_0 is accepted when the significant value gained> alpha of 0.05. H_0 is rejected if the significance value obtained < alpha of 0.05. H_0 of the study was no difference in an average learning outcomes concept of understanding science learning, in the learning model *Hybrid Learning Type 1* and Hybrid 2 mode learning. H_1 is that there are differences in the average learning outcomes of the understanding of science learning concepts in the Hybrid Type 2 and Hybrid Type 1 learning models. Below are the *ANOVA* test results of the average learning outcomes of understanding the concepts of science learning in class with Hybrid learning models based on Hybrid Types.

Table 4: Table of ANOVA Test Results

Information	p-value
Learning model *Type 2* and Type 1 class	0,000

R square (R ^{2}) = 0. 498

The *ANOVA* results in the above table for the learning outcomes of the understanding of science learning concepts in the *Hybrid Learning* and Conventional Classroom learning models (*face to face*), show a significance value of 0,000 (p <0.05). Therefore Ho is rejected, and it can be concluded that there are differences in learning outcomes of understanding the concepts of learning science in learning models *Hybrid Learning* Type 1 and Class hybrid learning Type 2.

The magnitude of the effect of giving the learning model Hybrid Type 2 and Class Hybrid Type 1 on learning outcomes understanding of the concept of science learning, is equal to (R^2) 49.8 %. The remaining 50.2 % is influenced by other factors, such as individual discipline, individual intelligence and so on. In other words, this study indicates that 49.8% of the learning outcomes, of the understanding of science learning concepts, are significantly affected by the Hybrid Type 2 and Class learning model factors Type 1 Hybrid.

Post Hoc Test

The post hoc test results were used to find out which class groups had significant differences with the significance criteria $p < 0.05$.

Table 5: Post hoc Test Results Table

Information	Face to face	Hybrid learning	Average difference	p-value
H acyl learn understanding the concept of learning science	52.72	77,758	-25,032 *	0,000

* there are significant differences

Based on Table 5 above, the *Post hoc* test results, with *pairwise comparisons*, showed a comparison significance of 0,000 ($p < 0.05$). This can be interpreted as that there are significant differences in the learning outcomes of the understanding of science learning concepts, between Hybrid Learning Type 1 and Hybrid Learning Type 2 learning models.

The observations are also illustrated in the following graph:

Figure 5.1. Development Chart Average learning outcomes of understanding the concepts of science learning
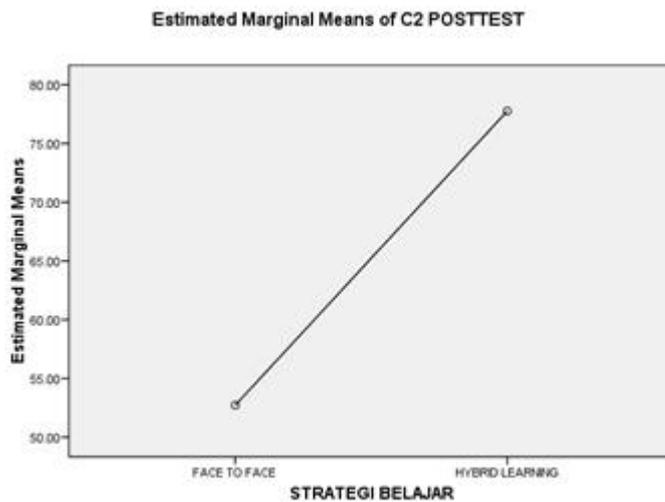
The graph in Figure 1 illustrates the results of learning to understand the concepts of learning science in groups with the Hybrid Type 2 learning model online. They show higher than the learning outcomes of understanding the concepts of learning science in groups with Hybrid Type 1 learning models.

Discussion

This study differentiates learning outcomes of understanding the concepts of science learning in the *Hybrid Learning* Type 1 learning model, and also in the Type 2 hybrid learning class. The effect of giving the learning model Hybrid Type 2 and Class Hybrid Type 1, on understanding the concept of science learning, is equal to (R^2) 49.8%. Therefore the hybrid learning model has advantages over conventional learning models in improving learning outcomes, for understanding the concept of science subjects, in elementary school teacher education students (teacher candidates). Previous research similarly found that hybrid learning , displaying various features in e-learning, makes it easy for students and educators to access knowledge and information that both fosters learning and immerses students in a learning environment that is rich in information and knowledge (Michel, 2008). In addition, hybrid learning is an acquisition of student-centred knowledge and skills that integrates digital technology (internet), mobile, computer), and facilitates students' direction of their learning process by their choosing available learning methods and materials according to individual characteristics and needs, and as oriented to achieve learning goals based on a given curriculum (Chirino-Barceló, 2011).

Learning outcomes understanding, for science learning concepts in groups with Hybrid Type 2 learning models, has an average learning outcome value of 77.76 (standard deviation 12.74). That exceeds the learning outcomes of understanding learning concepts of science in groups with Type 1 learning models, namely 52.73 (standard deviation of 12.59). This shows that the Type 2 hybrid learning model is superior in increasing the understanding of science learning concepts in students (prospective teachers) of primary school teacher education. This study shows that Hybrid Type 2 learning with asynchronous learning systems plus virtual presence through e-learning, significantly improves learning outcomes, compared to Type 1 hybrid learning models that use asynchronous systems plus face-to-face attendance. These findings are strengthened by previous studies, where Hybrid Learning using online classes, more than 70%, could increase togetherness and informal interaction through the student community, when completing group assignments outside of class face-to-face (Schaber, McGee, & Jones, 2015). The same findings state that online hybrid learning impacts internal interactivity (between students, students, content), external interactivity (students with colleagues, friends and family), and the quality of education and learning involvement of students (Morrow & Bagnall, 2009).

Learning outcomes can be considered as determining the effectiveness of learning. Kemp (2001) states that, if in a systematically planned academic learning, the results reach 80% of the objectives set, then the program can be accepted as very effective. The study found that Teaching Games For Understanding (TGFU) Hybrid Learning and face-to-face learning influenced learning outcomes (Gil-Arias, Harvey, Cárceles, Práxedes, & Del Villar, 2017). Similarly Hybrid Learning also benefited the professional development of teacher and student learning outcomes (Moore, Haviland, Moore, & Tran, 2016). Then hybrid learning can also improve students' conceptual understanding of learning material (Prunuske et al., 2012), and students who take learning with hybrid have higher learning satisfaction scores than students who attend traditional classes face-to-face (Kamberelis & Wehunt, 2012). The results of other studies revealed that hybrid learning also allows students to learn basic information outside of class time, creating a class period to be dedicated to the conceptual understanding of the material (Prunuske et al., 2012). The teacher's positive perspective on Synchronous Mixed Learning is that teachers can reach distant students in real time through their presentations, teachers can answer student questions and respond directly, improve the quality of learning for all students, enable teachers to enhance the active learning of all students, as teacher catalysts to reflect learning and teaching approaches used by teachers which can ultimately improve their pedagogy (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2014).

Conclusion

The ability to understand science concepts between students taught using the hybrid learning model with conventional learning models through direct delivery of learning materials or forms of face-to-face lectures shows a significant difference. Furthermore, the use of Type 2 hybrid learning models (asynchronous plus virtual classrooms) is significantly superior to Type 1 hybrid learning models (asynchronous plus face-to-face classes), in understanding the concept of science learning courses in primary school teacher education. The Hybrid Learning Model can be a reference for practising and prospective teachers, when teaching in colleges, schools and other educational institutions, by emphasising synchronous and asynchronous online learning.

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