

Information and Communication Technology in Elementary Schools: A Comparison Between Hybrid and Face-to-Face Learning Systems

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Submitted: 2022-02-15
 Accepted: 2022-05-20
 Published: 2022-07-20

DOI: 10.23917/ppd.v9i1.17534

Keywords:	Abstract
<p> <i>elementary education;</i> <i>hybrid learning;</i> <i>information technology;</i> <i>learning systems;</i> <i>face-to-face learning</i> </p>	<p> <i>At the beginning of 2020, the world was experiencing the Covid-19 pandemic, and Indonesia was no exception. The occurrence of this affects the learning system in Indonesia, the learning system that was originally face-to-face was forced to online form, in this case the teachers are required to provide a creative, efficient and optimal learning system for students. So the purpose of this study is to find out the difference in the average learning result of elementary school students during the pandemic. The method used in this study is quantitative with a posttest-only control group design. The population in this study were grade 4 elementary school students in Majalengka district, Indonesia. There were 64 samples and was taken by purposive sampling. The results of this study are that there are differences in the average student learning results where students who study with the hybrid learning system are higher than the face-to-face learning system. The hybrid learning system is very reliable in the 4.0 era as well as learning during the Covid-19 pandemic. However, for the record, it is necessary to look at the facilities and infrastructure considering that this system relies on technology, it is necessary to understand and be able to control the learning media for both teachers and students so that learning outcomes can be optimal and minimize the occurrence of obstacles. The present study revealed the implementation of 21st century learning.</i> </p>

INTRODUCTION

Background

The Coronavirus Disease 2019 (COVID-19) has caused widespread devastation throughout the world, including Indonesia. The occurrence of this pandemic has an impact on the learning system in Indonesia. The learning system, which was originally face-to-face, has been forced to be online in accordance with the government's rules and policies. In this

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case, teachers are required to provide a creative, efficient, and optimal learning system for students. It should be highlighted, however, that Indonesia has now reached the era of the Fourth Industrial Revolution, in which information technology has become part and parcel of human life. One of the features of this period is digitalization, which means that technology now facilitates all human activity (Suwardana, 2018). As a result, the transition from face-to-face to online learning should not pose a considerable problem.

Considering at the technology-based hybrid learning system, computer-based education has been implemented and proclaimed in the curriculum. Computers can help learning in various ways, such as presenting data and information, providing an overview of abstract things to be more open and imaginable to students so that meaning arises, facilitating interaction, and encouraging curiosity in students which is also in line with increasing student achievement. The computer taxonomy can be described in basic terms, namely (1) teaching about computers, (2) teaching with computers, and (3) managing educational administration with computer assistance (Sunarto, 2011). The hybrid learning system is very reliable in the 4.0 era as well as learning during the Covid-19 pandemic. However, for the record, it is necessary to look at the facilities and infrastructure considering that this system relies on technology, it is necessary to understand and be able to control the learning media for both teachers and students so that learning outcomes can be optimal and minimize the occurrence of obstacles. The good news is that students in this era are Generation Z, which are children who are close to technology, so it is easy to manipulate and teach them. From the teacher's point of view, this system also needs to be combined with methods, models and approaches that are appropriate to the situation and conditions of students, the environment and society.

Problem of Study

Learning problems emerged during the COVID-19 pandemic. It was discovered that there was a positive change in learning styles marked by the growth of active and creative attitudes of students, but there were also changes in negative learning styles marked by a decrease in students' desire to learn (Aldiyah, 2021). Online learning was less effective because many students did not understand the learning material (Setyaningrum et al., 2021), which affected student learning outcomes. Similarly, Generation Z students experienced online learning problems during the pandemic such as technical problems, not mastering the application, boredom in participating in learning activities, and difficulty understanding the material (Malelak et al., 2021). A study in Morocco demonstrated interior and exterior problems from the teacher's point of view in the use of information technology in foreign language learning – interior factors include teacher attitudes and dilemmas in the use of ICT, lack of knowledge and competence teachers in the use of ICT, while exterior factors are related to the lack of ICT-based facilities and equipment (Ismaili, 2021). These two factors create constraints in the learning system, influencing the performance, mindset, and achievement of the students.

Knowing the existence of these problems is the basis for the need for comparison of learning systems to determine the effectiveness of learning that can be applied in the 4.0 era along with the covid-19 pandemic, which is the uniqueness of this study with previous research. The study compared the learning system that occurred during (hybrid) and after (face-to-face) the pandemic, with the accumulation of score data for one full academic year taking into consideration Information and Communication Technology (ICT) at the elementary school level. The face-to-face indicated was after the strike of the pandemic where physical meeting was normally by the government.

State of the Art

Learning results can be translated into two constituent words, results are a cause and effect of the acquisition of a process which includes activities and changes. While learning

is an attempt to instill behavior in a learner, both cognitive and affective. Psychologically, learning can be translated into a process of behavioral change that is actually experienced in interaction with the environment (Slameto, 2014).

The hybrid learning system is expected to be a solution and mediation of a blend of face-to-face learning experiences by maximizing the presence of technology, considering that during a pandemic, students study at home or online. The hybrid learning system is a combined method or combination of face-to-face learning with online learning with the help of information technology, in other words, this system will utilize teaching materials based on information and communication technology but can still apply pedagogical approaches such as cognitive, behavioristic, constructivism and centered in students (Chirino-Barceló & Molina, 2011) This hybrid learning system also has benefits including creating an effective and efficient learning experience, easily accessible and flexible, it can even reduce costs and energy for learning and teaching, this system can also facilitate students to learn independently optimally (Bryan & Volchenkova, 2016).

Citing from Koehler et al. (2013) published Technological Pedagogical Content Knowledge (TPACK) as the basis for the teacher's knowledge framework in integrating technology in the education curriculum system. This framework has three main components, namely technology, content, and pedagogy, where TPACK is a slice of these three components, as described in Figure 1.

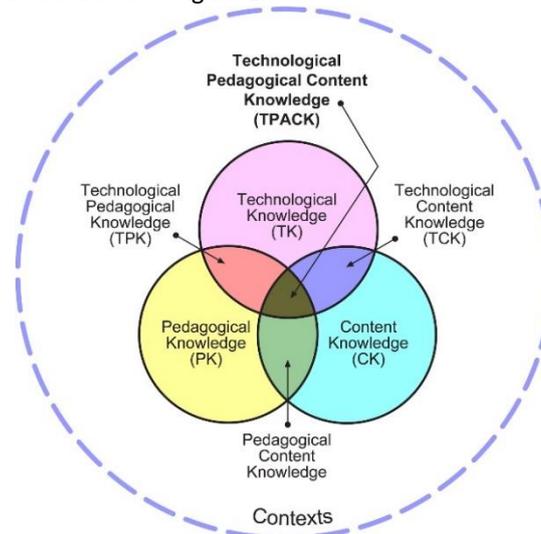


Figure 1: The TPACK Framework (Image from <http://tpack.org>)

The TPACK framework shows a dynamic relationship that is born, namely pedagogical content knowledge (PCK), technology pedagogical knowledge (TCK), technology pedagogical knowledge (TPK), and pieces that make up technology pedagogical content knowledge (TPACK). Mishra & Koehler (2013) suggested that teachers need to integrate technology, content and pedagogy so that learning needs are balanced, especially this integration helps learning more effectively, of course this integration needs to be regulated in curriculum development. Technology needs to be included in the curriculum in order to adapt to the world's progress in the digitalization era 4.0. Furthermore, it is hoped that students in this era can collaborate for the future. This statement reinforces the belief that learning in this era requires technology-based learning systems such as hybrid learning, especially in Information and Communication Technology (ICT) subjects.

Gap Study & Objective

The assumption in this study is that student learning outcomes with a hybrid learning system are better than students who learn when using a face-to-face learning system. The problem-solving approach in this study uses a quantitative approach with a posttest-only control group design, with inferential statistical analysis. The results of this study are expected to provide an overview, evaluation, and reference for educators in Indonesia regarding efficient and optimal learning systems, media and teaching methods implemented in the 4.0 era as well as during the Covid-19 pandemic, especially at the elementary school level for Information and Communication Technology (ICT).

METHOD

Research Design and Participants

The study employed a quantitative specifically a posttest-only control group design, in which data was limited to posttest data (Sugiyono, 2018). Participants of the study were 64-purposively chosen 4th grade elementary students in Majalengka District, Indonesia during the school year 2020-2021. Purposive sampling was used because there was a compatibility with the research plan, such as the availability of infrastructure, the implementation of new policies related to technology-based curricula following the pandemic, and the existence of ICT learning at the elementary school level where not all schools exist.

Data and Data Sources

The data used were obtained from the learning outcomes of grade 4 students in odd semesters and even semesters. The difference is the learning system used. The first data is the learning outcomes of odd semesters using a hybrid learning system, while the second data is the learning outcomes of even semester students using the face-to-face learning system.

Data Collection Technique

The data collection technique in this study used the document technique, where the source of research data was obtained from existing data from the school. The instrument in this research is student learning outcomes in the form of quantitative data, the indicators used are: 1) Cognitive domain includes knowledge, understanding, application and analysis; 2) The affective domain includes receiving, responding, valuing, and characteristics; 3) Psychomotor domain, including physical, reflex, perceptual, and communication skills.

The learning outcomes data are divided into two groups, the first group using a hybrid learning system and the second using a face-to-face learning system. These learning outcomes are the daily average points of students in the two groups, each of which is carried out for one semester or for one academic year as a whole. These daily values already include the indicators of the research instrument previously mentioned. Regarding learning media, the hybrid learning system media used are Google Classroom applications, Google Forms, WhatsApp, web browsers, digital whiteboards, social media and Zoom Meetings. While the face-to-face learning system uses conventional media found in classrooms and computer labs.

Data Analysis

There are two independent variables, namely the Hybrid Learning system (X1) and the face-to-face system (X2), while the dependent variable is student learning results (Y). The stages of testing the data in this study are normality test to find out if the data is normally distributed or not, then homogeneity test is carried out to determine whether the variance of the data is homogeneous or not, and finally the sample mean difference test. For the level of acceptance and rejection, the 95% confidence level is used.

RESULT

Data on student learning outcomes using both the hybrid learning system (X1) and the face-to-face learning system (X2) came from the same sample of 64 students. The following is the result of the comparison of the descriptive statistical values of the two data.

Table 1. Descriptive Statistics

Group	N	Mean	Std. Deviation	Min	Max
X1	64	83.16	6.011	70	95
X2	64	79.30	7.237	63	91
Total	128	81.23	6.903	63	95

Based on the Table 1, it can be seen that the average score on the hybrid learning system (X1) is 83.16 and the face-to-face learning system (X2) is 79.30, this shows the average score between two different samples, where the average score on the hybrid learning system is higher compared to face-to-face systems. While the Standard Deviation value indicates that the higher the points, the distribution of the data increases the average points. To find out whether there is a definite difference in the mean scores of the two samples, it is necessary to carry out an inferential test as follows.

Test for Normality and Homogeneity

Normality and homogeneity tests were carried out to determine the next data analysis technique, if the data were normal and homogeneous then proceed with parametric tests but if the data were not normal it would be continued with non-parametric tests. The normality test will use the Kolmogorov Smirnov formula because it can test for normality with large and small (Lestari & Yudhanegara, 2018). The results of data testing assisted by SPSS version 26 are shown in the following Table 2.

Table 2. Normality Test Results

Group	Kolmogorov-Smirnov Test			Desc.
	Statistic	df	Sig.	
X1	0.109	64	0.082	Normal
X2	0.101	64	0.169	Normal

Based on the output of Table 2, the P-level (Sig.) of the hybrid learning system score data (X1) is 0.082 and the face-to-face system score data (X2) is 0.169. Because of the two P-level points (Sig.) > 0.05, it can be said that at the 95% test level, the two samples met the normality of the data. Furthermore, the homogeneity test is carried out as follows:

Table 3. Homogeneity Test Results

Group	Levene Statistic	df1	df2	Sig.	Desc.
X1 - X2	1.804	1	126	0.182	Homogenous

Based on the output of Table 3, the P-level (Sig.) of 0.182 is accepted. Because the P-level (Sig.) is greater than 0.05, it can be concluded that at the 95% test level the two variances are homogeneous.

Mean Difference Test (t-test)

Once it is known that the scale of normality and homogeneity of the data are met, the next step is to perform a parametric test, namely the t-test to determine the difference in the mean of the two samples. The test hypothesis used is a two-way test, namely as follows.

$$H_0 : P_1 = P_2$$

There is no difference in the average student learning outcomes between students who are given a Hybrid Learning learning system and students who are given a face-to-face learning system.

H1 : P1 ≠ P2

There is a difference in the average student learning outcomes between students who are given a Hybrid Learning learning system and students who are given a face-to-face learning system.

The criteria for testing the hypothesis at the 95% confidence level are as follows:

If the P-level points (Sig. 2-tailed) 0.05, then H0 is accepted. Meanwhile, if the P-level (Sig. 2-tailed) < 0.05, then H0 is rejected.

The results of data processing with the help of SPSS version 26 are obtained as follows:

Table 4. T-Test Results

Group	t _{count}	df	t _{table}	Sig. (2-tailed)	Description
X1 – X2	3.28	126	1.98	0.001	H ₀ rejected

Based on the output of Table 4, it was found that the P-level (Sig. 2 tailed) was 0.001 < 0.05, so according to the decision, H0 was rejected, and it could be concluded that there was a difference in the average student learning outcomes between students who were given the Hybrid Learning learning system and students who were given the face-to-face learning system. Further analysis on the achievement of student learning outcomes can be seen as follows:

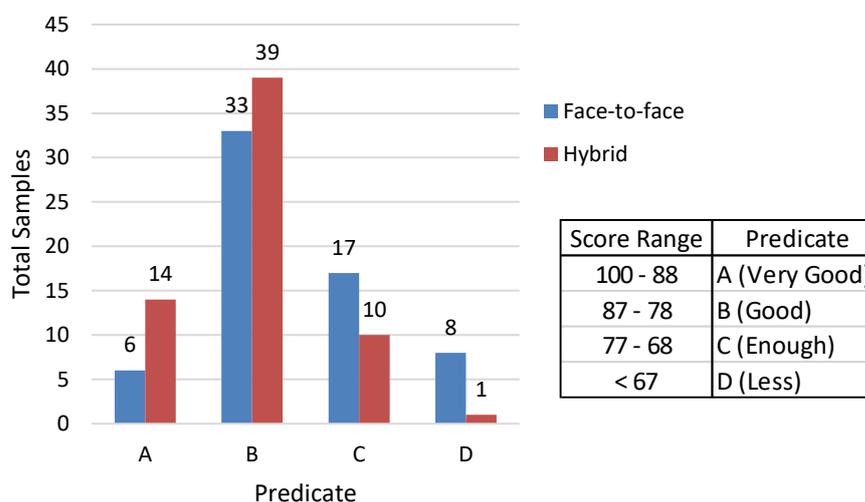


Figure 2: Achievement of Student Learning Outcomes Based on Predicate

Based on Figure 2, it is certain that the achievement of hybrid learning outcomes in the A (Very Good) and B (Good) predicates is more than in the face-to-face learning achievement sample.

DISCUSSION

The results showed that there was a significant difference in the average student learning outcomes between students who were given the Hybrid Learning system and students who were given the face-to-face learning system. Where the average value in the hybrid learning system is higher than the face-to-face learning system. These results suggest that there are several factors, internal factors in students such as the interest and motivation to learn when implementing hybrid learning. Basically, students already have an interest in the realm of technology, so the application of technology-based learning such as hybrid learning becomes very relevant. External factors such as the school environment and students' families, the existence of facilities and support from schools, teachers and

students' families can trigger the implementation of effective learning in accordance with the conditions and abilities of students.

The use of a hybrid learning system has also not only succeeded in improving physics learning outcomes at the junior high school level as the results of a study by Saadjad et al (2016), but also can improve Information and Communication Technology (ICT) learning outcomes at the elementary level. Hybrid learning is not only able to improve student learning outcomes, the results of the study of Hediandah and Surjono (2020) stated their findings that hybrid learning provides a positive response from teachers, this system has an influence on the interactive learning environment, trains students to learn independently and improves student skills, especially this system is in accordance with the demands of the times that need 21st-century learning innovations.

The hybrid learning system does not only deserve to be applied at the elementary school level for Information and Communication Technology (ICT) material, judging by the study of Prihadi et al. (2021) hybrid learning has succeeded in achieving a satisfactory point of understanding and student skills in the subject of citizenship geography. The same thing also happened to the results of the study of Hariadi, et al (2016) where the learning outcomes of high school students by utilizing digital technology media for economic material proved to be effective and had a significant positive effect. In line with the results of the study by Rorimpandey and Midun (2021) which confirmed that hybrid learning is one of the best learning models that can be used for students who are still adapting to the development of internet technology, hybrid learning is able to have a significant effect on increasing concept understanding abilities.

The success of the hybrid learning system does not only occur in this study, looking at the study of Purnamawati et al (2019), stated the level of use of information technology in vocational students in the city of Makassar, Indonesia, the results of the study on the use of information technology were at a managed and measurable level, besides the ability of teachers in integrating information technology meets the criteria very well. Reinforced by Lestari (2018); Suminar (2019) The successful application of information technology adds to the evidence that the 4.0 era is in line with the use of information technology in the curriculum system.

The hybrid learning system is very well applied in the 4.0 era and during the COVID-19 pandemic which requires the role of technological advances in the learning system, in line with what Verawati and Desprayoga (2019) stated. The hybrid learning system is a solution to increase time effectiveness, cost efficiency, energy and attracts students to learn with various media and environments. The implementation of the face-to-face learning system in this research cannot be said to be bad, student learning outcomes are still quite good. However, to get optimal results, intensified mentoring and tutorial assistance to the elementary students may be adopted by their teachers to facilitate effective learning amid the transition from hybrid to face-to-face learning (Pentang, 2021).

CONCLUSION

Based on the results of data analysis that has been shown previously, it can be concluded in general that the comparison of learning outcomes of Information and Communication Technology (ICT) with a hybrid learning system is better than the learning outcomes of face-to-face teaching systems for elementary school students. The implementation of the hybrid learning system in this research brings benefits in an effort to provide effective and appropriate learning in accordance with the pandemic situation and can be an alternative for the transition period from online learning to face-to-face learning. The limitation of this study is that it only focuses on learning Information and Communication Technology (ICT), meaning that it is not comprehensive in all subjects, besides that, it would be better if this

study involved more samples spread across various cities in Indonesia. Follow-up on this study can be done by expanding the sample and examining the inhibiting factors and learning success factors in students both cognitively and affectively so that the study results are much more reliable. Weaknesses in hybrid learning depend on the competence of teachers in understanding and integrating technology-based learning media, therefore, to bury this weakness it is necessary to upgrade the competence and knowledge of technology-based teachers. The hope from this research is that hybrid learning system can be developed in the Indonesian curriculum, considering that currently there are still disadvantaged areas that have not been touched by technology. Given the importance of technology in the 4.0 era and becoming a trend of progress in the future.

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