Application of Hybrid Learning Learning Model Based on TCK (Technological Content Knowledge) on Student Learning Outcomes of Geography Subject Class X IPS Senior High School (SMAN 6) Padang

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Abstract. School policies have options to adopt hybrid learning thanks to the joint decree of four ministers (number 03/KB/2021), which outlines principles for the implementation of learning in the Covid-19 age. Learning is carried out to monitor student activities, both face-to-face by utilizing technology in each process, as well as online learning processes. This study's goal was to examine how the hybrid learning model was used to improve student learning results. This kind of research uses a quantitative descriptive methodology and is experimental. Purposive sampling is used to sample the class X IPS research population, with the requirements that the pupils have good internet connection and a keen interest in learning. The sample is classified as X IPS 1 (experimental class) and X IPS 3 (control class) based on these characteristics. Data collection techniques use observation techniques for initial conditions, *Pre-test-Post-test* and *Control Group Design Techniques* to collect data on student learning outcomes. The data analysis technique used the *Independent Samples T-test* as a hypothesis test. The results showed that, 1) the application of the *Hybrid Learning Model*, learning TCK-based, in proving the hypothesis was accepted using the T-test, where the calculation results obtained sig. (2-tailed) of 0.000 with a significant level of 0.005. This indicates that 1) the hybrid learning model is implemented more effectively in the experimental class than in the control class, and 2) the average effectiveness level of the experimental class's learning outcomes is higher than that of the control class, with a N Gain value of 0.76 classified as "effective" in contrast to the control class's N Gain value of 0.24 classified as "less effective."

Keywords: learning model, hybrid learning, learning outcomes

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1 Introduction

The rapid development of information and communication technology (ICT) has significantly improved school education, particularly learning. While alluding to [9], one of the center skills of educators in the educational perspective is the utilization of Data and Correspondence Innovation (ICT) for learning. Teachers have used the development of learning methods, learning models, and technology-based learning media to improve the quality of education by making it easier for students to access technology.

According to his research, technological advancements alter the way learning is carried out, as stated above [3]. "Information and Communication Technology-Based Learning" refers to the use and growth of Information and Communication Technology (ICT) in educational activities. Teachers and students can explore and develop learning activities effectively and efficiently thanks to the system's facilities [6].

The rapid development experienced by technology users in the world also has a significant influence on the pandemic Covid-19 and its impact on all areas of life, especially in the field of education. Besides, [10] expressed, the Coronavirus pandemic essentially affected understudies, educators or guardians in doing web based learning exercises and the advancement of understudy learning results.

The impact of Covid-19, several agencies have implemented “Work from Home” (WFH) or work from home, including educational institutions or agencies. Every school must follow a government policy that requires them to use laptops or smart phones to access websites or online learning links like Google Forms, Microsoft 365, Google Classroom, and others. Online learning like this is allegedly weakening students' interest, motivation, and learning outcomes. Consequently, the implementation of learning must be reorganized and adapted to follow the provisions of the health protocol, prohibiting people from gathering in one crowded place. The government has also developed a number of policies to mitigate the effects of Covid-19 on education. Eye to eye learning is canceled, learning is helped out at home through distance learning and by utilizing on the web media [1]

[5] One verse stipulates that face-to-face learning is restricted to the SMA/MA level with a mechanism for implementing classroom learning, a maximum of 20-50 percent of class capacity, a minimum distance of 1.5 meters, and a maximum of 18 students divided into class groups. type of Shift learning.

The above policy has given school opportunities to reopen classes for face-to-face learning with health protocol rules that allow schools to carry out combined learning (Blanded Learning) between offline and online, or fully online (Hybrid Learning) at the same time. [16] revealed that students' attitudes toward the Internet are developing statistically significantly and that the blended learning model contributes more to students' biology achievement than traditional teaching methods. Additionally, Hybrid Learning offers a number of benefits, including: Learning reaches remote areas, helps students stay connected during long absences, teaches teachers and students how to use the latest communication technology, and is adaptable in a comfortable learning environment. It also offers synchronous learning—learning in person and online simultaneously.

Learning solutions that can be implemented during the Covid-19 pandemic require teachers to think creatively, collaborate with students and parents, innovate, and adapt to changes and existing technology. Teachers must use skills in learning by combining the use of technology with the material being taught. According to [4] regarding one of the slices in the TPACK (Technological Pedagogycal Content Knowledge) framework, namely; TCK

(Technology Content and Knowledge) understanding of the ways in which technology and content influence each other and limit knowledge of how material can be researched or represented by technology. In addition, professional teachers are required to possess sufficient TPACK competencies, as TPACK falls under the purview of the four primary competencies of a teacher, which are pedagogic competence, personality competence, social competence, and professional competence. Skills in using technology in presenting material in learning can be applied in learning geography.

Learning outcomes are skills and competencies that have been mastered by students which are obtained through the learning process. Students are declared successful in learning if they are able to show changes when they think. Changes in learning outcomes can be observed, measured, and proven in the abilities or achievements of students as a result of student learning experiences. As a result, teachers must be able to create online learning that is both simple and effective by utilizing the right online tools or media and adhering to the subject matter being taught. The teacher must be able to choose and limit the scope of the material and the application that is suitable for the material and learning methods used because online learning will provide more opportunities to explore the material to be taught.

SMA Negeri 6 Padang has modified the Covid-19 learning process so that some students must study at home using hybrid learning (online learning) while others only have limited face-to-face learning in class. Study groups will be set up alternately each day. Teachers need the appropriate learning presentation model for the online learning process. When conducting observations and talking directly with one of the Geography teachers at Senior High School (SMAN 6) Padang, it was found that there were problems when online learning took a long time to interest, and learning outcomes decreased significantly. This occurs due to the distinct quality of classroom instruction in comparison to face-to-face instruction.

Due to the background and issues that arose as a result of the Covid-19 pandemic and government regulations, it was necessary to limit the number of students enrolled in the class. This resulted in the formation of two distinct study groups (shifts), one online and one offline, which made it possible to learn using the Hybrid Learning Model mechanism. While learning from a distance allows teachers and students to be in different locations with different commitments and skills in operating technology, they do not meet face-to-face [14, 15]. In geography class X IPS at SMA Negeri 6 Padang, Content Knowledge) and conventional models (WhatsApp and Google Classroom) are used. In the end, it is possible to track changes in the learning outcomes of students and determine whether the Hybrid Learning Model is effective or ineffective based on the learning outcomes of students.

2 Research methods

Using the Pretest-Posttest Control Gathering Plan as a trial, this type of research employs genuine exploratory methods with specific attention paid to the subjects under investigation. The experimental group received instruction synchronously using a Hybrid Learning Model based on Technology Content Knowledge (TCK), whereas the control group received instruction unaided using the conventional model through WhatsApp and Google Classroom.

The research population, according to [12], is a generalization area in which the researcher selects objects or subjects with specific characteristics to be studied and determined. At Senior Secondary School (SMAN 6) Padang, all of the students are class X IPS.

The sample is a part of the population that will be studied. The students in the designated class had adequate internet access, a high interest in learning, and higher grades for previous learning outcomes, so they were selected for this study using purposeful sampling.The following is a sample table in this study:

Table 1. Research Samples for Experimental Class and Control Class

No	Class	Student Respondents	Responden	Information
1	X IPS 1	36 students	36 students	Experimental
2	X IPS 3	36 students	36 students	Control

Source : Primary Data Analysis. 2021

The test instrument included a variety of decision questions. The syllabus's six achievement indicators are taken into consideration when writing the test questions. The geology materials in Essential Capability 3.7, titled "Hydrosphere Elements and Its Effect on Life," are used to determine students' learning outcomes in class X IPS Even Semester. The following instrument grid has been prepared by the researcher.

Table 2. Basic Competency Instrument Grid, Indicators, and Question Items

Competence Base	BC	Indicator	Question Items
3.7 Analyzing the dynamics of the hydrosphere and its impact on life	3.7.1	Understanding the hydrologic cycle	1- 7
	3.7.2	Identify the characteristics and dynamics of marine waters	8 – 14
	3.7.3	Analyzing the distribution and utilization of marine biota	15 – 21
	3.7.4	Understanding pollution and marine water conservation	22 – 27
	3.7.5	Analyzing the potential, distribution, and utilization of inland waters	28 – 34
	3.7.6	Grasping the elements of the hydrosphere and its effect on life	35 - 40

Source: Geography Syllabus for Class IPS Even Semester

The right and great test instruments were acquired through Instrument Test and Investigation, to be specific; 1) Validity; 2) Reliability; 3) Problem Difficulty Index; and 4) Instrumental Uniqueness. The instrument test's results were used to determine whether the questions were feasible. Only 26 of the 40 questions that were tested on the instrument merit drawing value points per question using the formula below;

$$\frac{Number\ of\ Inquiries}{100} = \frac{26}{100} = 3{,}846$$

That is, each of the 26 questions used to collect data from the Pre-test and Post-test has a weight of 3.8461538461.

Observation techniques were used to conduct preliminary studies, test techniques for students' prior knowledge, and documentation was used to conduct research as data collection methods. The methods of collection were as follows;

1. Test

According to [11] A test is a series of questions, exercises, or other tools used to measure a person's or group's skills, knowledge, intelligence, abilities, or talents. Using questions that have been adjusted to the BC (Basic Competencies) 3.7, learning materials titled "Hydrosphere Dynamics and Its Impact on Life," the test is carried out here to measure student learning outcomes.

2. Documentation

In addition to the test method, facts and data stored in letters, diaries, photo archives, and activity journals serve as the basis for data collection. Documented data can be used to find the necessary information.

The required documentation includes internal documentation in the form of a description of school profiles, facilities and infrastructure, student data, education staff, number of students, and an overview of the location of Senior High School (SMAN 6) Padang. While external documentation is in the form of reference books, journals related to previous research, books sourced from the internet.

2.1 Data Processing Techniques

2.1.1 Test of Normality

The normality test is used to determine whether or not the data within each sample group are normally distributed. The ordinariness test was completed utilizing the SPSS program for 26 inquiries by looking at the importance worth of Kolomogorv-Simirnov with an importance level of 5% (0.05)

a. If Sig. > 0,05, the data follows a normal distribution.
b. When Sig. < 0,05, the data do not follow a normal distribution.

2.2.1 Homogeneity Test

The purpose of the homogeneity test is to determine whether the variants in the data from each sample group are the same or different. Using the SPSS program and 26 questions, the homogeneity test was performed by comparing the significance value to a level of 5% (0.05).

a. If Sig. > 0,05, then the data is homogeneous.
b. If Sig. < 0,05, then the data isn’t not homogeneous.

2.2 Data Analysis Technique

The process carried out before analyzing the data is processing the data first as follows:

a. Coding and checking the entire list of questions distributed to respondents.
b. Tabulation to calculate the score results and arrange them into a table.

Using the SPSS program and a T-test with a 5 percent significance level, the following information was analyzed:

a. Similarity Test
b. Similarity Test carried out on the pre-test data obtained to determine whether there is The Similarity Test was performed on the obtained pre-test data to see if the average

pre-test scores of the experimental and control groups before treatment were comparable. The Independent Sample T-Test or Mann-Whitney as a non-parametric test was used to conduct the similarity test, with a significance level of 5% (0.05). After the Independent Sample T-Test or Mann-Whitney results for each of the 26 questions were obtained from the SPSS program, the scores were evaluated using the following criteria:

1. If the value of Sig. (2-tailed) > 0,05 it means that there is no significant difference between the value of the experimental class and the control class.
2. If the value of Sig. (2-tailed) < 0,05 it means that there is a significant difference between the value of the experimental class and the control class.

c. Test of Differences

A difference test was performed on the post-test results of students in the experimental and control classes who received treatment. When evaluating the hypotheses tested in this study, the difference test serves as a standard. The Independent Sample T-Test or Mann-Whitney as a non-parametric test with a significance level of 5% (0.05) was used to calculate the difference test. After the Independent Sample T-Test or Mann-Whitney results from 26 questions were retrieved from the SPSS program, the scores were evaluated using the following criteria:

1. If the value of Sig. (2-tailed) > 0,05 it means that there is no significant difference between the value of the experimental class and the control class.
2. If the value of Sig. (2-tailed) < 0,05 it means that there is a significant difference between the value of the experimental class and the control class.

The data will be analyzed using the N Gain statistic in addition to the "T-test" test. The difference between the Pre-test and Post-test scores is called N Gain, and it can be used to determine how much students' abilities have improved since they learned a concept. The Gain Index analysis in this study is a normalized N Gain written as follows:

$$\mathrm{g} = \frac{\text{Score } Post - test - \text{Score } Pre - test}{\text{Score 2 Ideal} - \text{Score } Pre - test}$$

The following table is used to categorize the N Gain value derived from the aforementioned procedure:

Table 3. Value N Gain Classification

Value of N Gain %	Efektivitas
< 40	Ineffective
40 – 50	Less Effective
56 – 75	Quite Effective
>75	Effective

Source : [2]

3 Results and Discussion

The value of student learning outcomes in BC (Basic Competencies) 3.7, as well as the learning materials titled "Hydrosphere Dynamics and Its Impact on Life," were the subjects of

the analysis. The data were collected using instruments in the form of test questions that had been evaluated for validity and reliability to ensure that the instrument was suitable for use as a tool for data collection. Information on understudy learning results, both trial class and control class, were tried for ordinariness and homogeneity first. The statistics used in hypothesis testing are determined by the normality and homogeneity tests' outcomes.

The study also included a hypothesis test (T-test) to address the hypothesis that was put forth. The learning outcomes of the Pre-test and Post-test scores of the exploratory class and the control class are then examined, as follows:

3.1 Analysis of Students' Initial Ability *(Pre-test)*

The pre-test scores were dissected to quantify the understudies' abilities to underlying in the exploratory class and the control class. In the experimental class and the learning control class, students are treated using the Hybrid Learning Model before receiving instruction via WhatsApp and Google Classroom. Coming up next are the information gotten from the consequences of the pre-trial of the exploratory class and the control class.

Table 4. Pre-test Values for the Experimental and Control Classes

Pre - Test							
Class	N	Question Items	Weight Value	Average	Highest Valua	Lowest Value	MCC
Experiment	36	26	3,846	40.28	61.54	19.23	80.00
Control	36			39.85	57.69	30.77	

Source: Primary Data Analysis 2021

The normality and homogeneity tests were carried out after the pre-test data were obtained. Pre-test data analysis in the experimental and control classes exceeds the 0.005 level, indicating that it is normally distributed, while pre-test data for both classes is homogeneous with Sig. Based on Mean 0.257, an Independent T-test using the SPSS 26 program will be performed for the similarity test.

Equal Variance Assumed Sig were the obtained Independent T-test results. 2-followed) is 0.833, which is more prominent than 0.005, so it tends to be inferred that the consequences of the Pre-test and Post-test scores on the Pre-test have no massive contrast. This indicates that the abilities of students in the experimental and control classes are nearly identical.

Table 5. Pre-test Statistical Test Results

Indenpendent Sample T-test	Level	Sig. (2-Tailed)
Equal Variance Assumed	5%	0,833
Equal Variances Not Assumed		0,829

Source: Primary Data Analysis 2021

3.2 Evaluation of the Final Ability of Students *(Post-Test)*

Following an analysis of the students' initial ability test via the Pre-test and an analysis of their final ability via the Post-test. The students in the experimental and control classes were

given the same test questions as the pre-test, which consisted of 26 valid and reliable questions. To support the proposed hypothesis, the learning outcomes data were t-tested. Analyzing posttest scores can help determine whether or not students' abilities improve after receiving treatment. Coming up next is the information gotten from the Posttest results.

Table 6. Experiment Class and Control Class Posttest Values

Post-Test							
Class	N	Question Items	Weight Value	Average	Highest Valua	Lowest Value	MCC
Experiment	36	26	3.846	85.79	96.15	65.38	80.00
Control	36			54.81	88.46	34.62	

Source: Primary Data Analysis 2021

After receiving the Hybrid Learning Model treatment, the experimental class's average learning outcomes increased by 45.51 points to 85.79 from 40.28, as shown in the table of average learning outcomes after the Post-test. Additionally, the control class's average post-test learning outcome was 54.81, 14.96 points higher than the pre-test average of 39.85. The graph that follows depicts the experimental class's average learning outcomes as well as the improvement in learning outcomes for the control class;

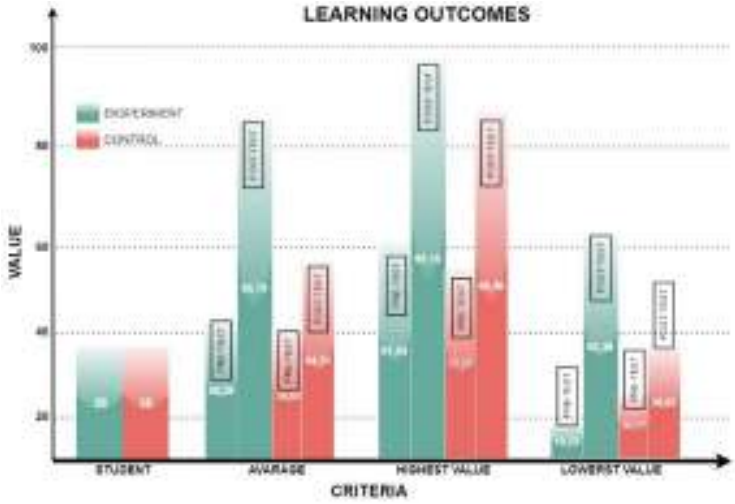

Fig. 1. Comparison of Pretest and Posttest Values' Outcomes

According to [7], students are motivated and interested in technology-based learning models. By utilizing technology that contains teaching material content, such as Google Classroom and Padled, learning models can become more interactive, and indirectly, students will also be interested in the content of the media. learning and the content that will be taught. so that it will improve student learning outcomes and result in engaging and interesting learning..

After the post-test data arrived, the experimental class and the control class underwent normality testing and homogeneity testing, while the post-test data showed that the two classes were homogenous with Sig. Based On Mean 0.275. The Independent Samples T-test was run

for the difference test using the Equal Variance Assumed value. Utilizing the SPSS 26 software, Sig. (2-tailed). The Independent Samples t-test on the SPSS 26 software yielded the following results.

Table 7. Post-test Statistical Test Results

Indenpendent Sample T Test	Level	Sig. (2-Tailed)
Equal Variance Assumed	0,005	0,000

Source: Primary Data Analysis 2021

The Equal Variance Assumed Sig (2-tailed) value of 0.000 is less than the probability of 0.005, according to the "Indentpendent T-test Statistic" report. Thus, there have been differences in student learning outcomes in the Posttest given.

According to data analysis, the final exam administered to the experimental class but not the control class resulted in a substantial difference in the test's average value. The Posttest table and graph, which show a substantial increase in the range of experimental class learning outcomes from Pre-test results to Post-test results, provide evidence in favor of this theory. The data analysis findings also demonstrate that in order to properly use the TCK-based hybrid learning model, students must have attentively studied the content that has been delivered.

Next, to answer the effectiveness or ineffectiveness of the Hybrid Learning Model, an analysis of the effectiveness of the Hybrid Learning Model was carried out using the analysis of the N Gain value, which is an analysis of the difference between the Pre-test value and the Post-ttest value. Effectiveness analysis to see changes in student scores from Pre-test to Post-test experimental class treated with Hybrid Learning Model, and the use of conventional learning media in the control class. In order to categorize the efficacy of the two models utilized based on the Pre-test and Post-test scores, each class will be examined for its gain value. Following is the outcome of the analysis of the N Gain value, which was conducted with the assistance of the Microsoft Office Excel program;

Table 8. N Gain Value Analysis's Result

Class	Avarage		Post-Pre Score	*Pre-test* Score	N Gain	N – Gain Score	Description
	Pre-test	*Post-test*					
Exsperiment	40.28	85.79	45.51	59.72	0.76	76 %	Efektive
Control	39.85	54,81	14.96	60.15	0.24	24 %	Inefektive

Source: Primary Data Analysis 2021

Nilai N Gain model pembelajaran hybrid yang digunakan pada kelas eksperimen sebesar 0,76 atau (76%) menurut hasil belajar nilai N Gain, sedangkan nilai N Gain model pembelajaran tradisional yang digunakan pada kelas kontrol sebesar 0,24, atau (24%) Berdasarkan temuan analisis nilai N Gain, dimungkinkan untuk memberi label model pembelajaran hybrid sebagai "Efektif" dan model pembelajaran tradisional sebagai "Tidak Efektif". Terlihat jelas dari pengujian hasil nilai N Gain bahwa Model Pembelajaran Hybrid telah berhasil digunakan untuk mendukung pembelajaran selama wabah Covid-19.

There are several other cutting-edge learning models that may be utilized to enhance student learning results, therefore the hybrid learning model is not the only one used to inspire and pique students' interest in learning. One of the learning model options used during the

Covid-19 epidemic to concurrently tackle learning issues in PPKM is the hybrid learning model.

4 Conclusion

The remainder of this paper can be concluded in view of the problem's formulation, research objectives, analytical findings, and arguments that have been previously reported;

a. The application of the Hybrid Learning Model based on TCK (Technology Content Knowledge) can improve the learning outcomes of class X IPS students in the Geography subject of Senior Higf School (SMAN 6) Padang. The value of Sig (2-tailed) is shown in the analysis's "output independent t-test statistic" to be 0.000, which is less than the probability level of 0.005. Therefore, it may be said that Ha is accepted but Ho is rejected.
b. The Hybrid Learning Model was used, with "Effective" results for the experimental class (synchronous) and "Not Effective" results for the traditional class (asynchronous). This is demonstrated by the fact that the experimental class's N Gain value was 0.76, which is 76% higher than the value for the traditional learning model's N Gain of 0.24, which is 24%.

Conclusions of the N Gain value analysis show that the Hybrid Learning Model at BC (Basic Competencies) 3.7, learning materials "Hydrosphere Dynamics and Its Impact on Life" in class X IPS at Senior High School (SMAN 6) Padang, offers better learning outcomes than conventional learning models.

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