The influence of TSOI hybrid learning model to physics learning outcomes in SMA Islam Athirah Bukit Baruga Makassar

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Abstract. This study aims to investigate the effect of TSOI Hybrid Learning model with Blended Learning approach compared with Blended Learning approach to students physics learning result in First Grade of Science Major SMA Islam Athirah Bukit Baruga. To support the continuity of this study used Quipper School LMS as a software that can connect between teachers and students online. This study consisted of 60 students divided into 2 groups, consisting of the untreated control group and the experimental group treated. This research uses Quasi Experimental method with design "Statistic Group Comparison". Based on the result of the research, it is found that the ability of first grade of science major students in SMA Islam Athirah Bukit Baruga is normal distributed with $\chi^2$ count > $\chi^2$ table = 4.40 > 11.07 for control group and $\chi^2$ count > $\chi^2$ table = 5.20 > 11.07 for experimental group and homogeneous with $f$ count of 0.680. The experimental group taught using the TSOI Hybrid Learning model with the Blended Learning approach found a statistically significant difference ($\alpha \leq 0.05$).

1. Introduction
An alternative 21st century educational context requires one to have high level skills in order to solve new problems. Learning skills can be summarized in three main subtitles, namely: information and communication skills, ability to think and solve problems as well as interpersonal and self-direction skills, so that to achieve the learning goals of the 21st century requires new approaches and methods in the learning process [1]. The application of learning methods in the 21st century emphasizes effective communication, collaboration, digital fluency and technology utilization [2]. The use of technology in the learning process is striving to be a means of obtaining information and discussion media to train students to learn independently and apply the knowledge they have [3].

TSOI Hybrid Learning Model is a four-phase cognitive learning combined from Piagetian science learning cycle model and the Kolb’s experiential learning cycle model [4–6]. The constructivism learning model proposed by Piagetian is a learning model that emphasize on the activeness of students [7], so that students must be actively involved and become the center of all classroom learning activities because the knowledge possessed by students is the result of their own formation [8]. Kolb’s experiential learning cycle model put forward his theory that the catalyst of the best learning process results from student experience, the experience gained by the student is then transformed into reflective observation and active experimentation with the guidance of a teacher [9,10]. The provision of active experiments can be done using virtual laboratories in applying Kolb learning models [9].
TSOI Hybrid Learning Model is a representative of four-phase cognitive learning process: Translating, Sculpting, Operationalizing and Integrating. This process is a learning procedure from inductive to deductive [10].

![TSOI Hybrid Learning Model](image)

**Figure 1. TSOI Hybrid Learning Model**

In physics learning, the TSOI Hybrid Learning Model application can be applied as follows: (1) Translating, in this phase the teacher provides several initial questions to generate motivation and explore students' experiences in accordance with teaching materials and learning materials that can help students obtain additional information and linking it to the experience he gained, (2) Sculpting, the information that has been obtained will be mixed and compiled into a complete concept and formulate a hypothesis, (3) Operationalizing, the hypothesis that has been compiled in the sculpting phase will be proven through practical activities, demonstrations and studies scientifically, (4) Integrating, a proven hypothesis will be implemented in the form of problem solving.

Implementation of Blended Learning is one solution to this problem. Blended Learning is a combination of learning done in the classroom and online. Blended Learning aims to maximize the knowledge gained by students [11]. The application of the Blended Learning approach requires an appropriate learning model, in the physical learning of the learning model that is applied it should fulfill the elements of Pedagogical Content Knowledge (PCK) consisting of Subject Matter Knowledge, General Pedagogical Knowledge (GPK) and Contextual Knowledge (CtK) [12]. One learning model that can be integrated with the Blended Learning approach is TSOI Hybrid Learning, this is based on research conducted by Poore et al [13]. That there is a significant influence on the understanding of scientific concepts and attitudes of students taught using TSOI Hybrid Learning Model. TSOI Hybrid Learning Model is a learning model that has four phases namely; Translating, Sculpting, Operationalizing and Integrating [4].

Blended Learning is a learning method that combines face-to-face instruction with online instructions that use computers (computer mediated instruction) [14]. The application of Blended Learning needs to pay attention to three main aspects, namely readiness, intensity and impact caused for students and teachers [11]. Blended hearing has characteristics in its application; 1) Time (time), students can learn according to the time they have, 2) Pace (speed), students can learn and work assignments according to their respective speeds, 3) Place (place), students can learn where only in the classroom, at home and in the library, 4) Path, students can use a variety of ways or instructional approaches to achieve learning goals, 5) Teacher-of-Record, educators who always help when students find difficulties [15–18].

Some schools in Indonesia, especially in the city of Makassar, have implemented the Blended Learning strategy as a form of implementing 21st century learning. Based on the results of observations conducted, Islamic Senior High School of Athirah Bukit Baruga has implemented the Blended Learning approach using Quipper School as software. Physics learning outcomes of students in class X MIPA that 48% are under the low category with a Minimum Completeness Criteria of 75.

According to Bloom taxonomy, overall the evaluation of student learning outcomes is divided into three aspects, that is: (a) Cognitive aspects, which include six stages of the thinking process; 1) Knowledge, 2) Understanding, 3) Application, 4) Analysis, 5) Synthesis and 6) Evaluate, each of these domains has an operational verb that can be used in making learning outcome tests in accordance with the basic competencies to be achieved; (b) Affective aspects, which include five behaviors; 1) Receiving,
2) Responding, 3) Valuing, 4) Organization, 5) Characterization by a value or Value Complex; and (c) Psychomotor aspects, which are related to skills, psychomotor assessment can be done using observation or interview [19].

The purpose of this study was to determine the effect of TSOI Hybrid Learning Model on physics learning outcomes of students in Islamic Senior High School of Athirah Bukit Baruga class X MIPA. Learning outcomes referred to in this study include cognitive aspects of students. This study uses Quipper School LMS as software that can connect teachers with students when online learning takes place. Quipper School consists of two main (1) Quipper School Link for teachers and (2) Quipper School Learn for students. Quipper School LMS has facilities that can support the learning process and can be accessed directly by the school and parents. Another advantage of Quipper School is that it can adjust to the curriculum that is applied in schools.

2. Methods

This research is a quasi-quantitative method of experimental research. The quasi-experimental research method is a research method that is used to look for certain treatment effects under controlled conditions. The design of this research is statistic of comparison group with pattern:

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  X   O1
-   O2
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Figure 2. Statistic Group Comparison

Information:
O1 : Experiment Class  
O2 : Control Class  
X : Hybrid Learning Model TSOI Treatment  
- : Without TSOI Hybrid Learning Model treatment

The sample in this study amounted to 60 people divided into the experimental group and the control group consisting of 30 people with the same abilities. Based on the sample obtained with the X1 group as the experimental group that received the treatment of the TSOI Hybrid Learning model and the X2 group as the control group that was not taught using the TSOI Hybrid Learning Model, each group was taught through the Blended Learning strategy approach using Quipper School LMS.

The data obtained in this study were collected using an objective test totaling 20 numbers in the form of multiple choice which aims to measure student learning outcomes. Data that has been obtained is categorized based on each student's score. The learning outcome test instrument used in this study will be tested for content validity using the Gregory Test conducted by two experts and the validity of the item using the ph biserial formula. The instrument that has been validated is then tested for reliability using the Kuder-Richardson 20 method.

Data analysis techniques used are descriptive statistics and inferential statistics. Descriptive statistics are carried out by calculating the mean, standard deviation and median of each group then presented in the form of a histogram. Inferential analysis aims to test the research hypothesis, before testing the hypothesis first, a prerequisite test consists of normality test and homogeneity test. Test normality using the formula Xcount, if the value of Xcounts < Xtable with dk = (k - 1) at a significant level α = 0.05 data is normally distributed. Homogeneous test using formula F, if the value of Fcount < Ftable then the data is homogeneous. Data that has been normally and homogeneously distributed is then analyzed to test the research hypothesis using the t-test formula with the two-party test testing hypothesis accepted if the table is < tcount. To obtain an overview of the scores obtained when the TSOI Hybrid Learning Model is applied throughout the population, it can be analyzed using the average estimated formula.
3. Result and Discussion

3.1 Descriptive Analysis

In this study the researcher ensures that the sample has a homogeneous condition in terms of learning outcomes, facilities and conditions of the study room. The sample was divided into two classes, namely the experimental class (X1) which was using the TSOI Hybrid Learning Model and the control class (X2) which was not using the TSOI Hybrid Learning Model. Assessment of student learning outcomes in the experimental class and control class is carried out by giving a test of learning outcomes in the form of 20 numbers of objective questions, aimed at finding out the learning outcomes and the influence of TSOI Hybrid Learning Model. The experimental class learning outcomes and descriptive control classes are shown in the following Table 1.

| Criteria          | Learning Outcomes |
|-------------------|-------------------|
|                   | X1    | X2    |
| Number of Sample  | 30    | 30    |
| Highest Score     | 18    | 13    |
| Lowest Score      | 7     | 3     |
| Average           | 12.30 | 7.53  |
| Standard deviation| 3.26  | 2.93  |
| Variance          | 10.63 | 8.58  |

Based on Table 1 the average score of the experimental class is 12.36 with the highest score is 18 and lowest score is 7 while the control class is 7.53 with the highest score is 13 and lowest score is 3. It can be concluded that the learning outcomes of student taught with the TSOI Hybrid Learning Model are higher. Frequency distribution of student learning outcomes can be seen in the following Table 2.

| Interval Category | X1            | X2            |
|-------------------|---------------|---------------|
|                   | Frequency     | Percentage (%)| Frequency | Percentage (%)|
| 0 – 4 Very Low    | 0             | 0             | 6         | 20           |
| 5 – 8 Low         | 5             | 16.67         | 11        | 3.67         |
| 9 – 12 Medium     | 12            | 40            | 12        | 40           |
| 13 – 16 High      | 9             | 30            | 1         | 3.33         |
| 17 – 20 Very High | 4             | 13.33         | 0         | 0            |
| **Total**         | **30**        | **100**       | **30**    | **100**      |

Based on Table 2 it can be seen that the highest percentage in the experimental class and the control class is 40% in the medium category. The percentage of high and very high categories in the experimental class was 30% and 13.33% while in the control class it was 3.33% and 0% for the percentage was low and very low by 0% and 16.67% in the experimental class and 20% and 3.67% in the control class. From these results it can be concluded that the TSOI Hybrid Learning Model is effective in using Blended Learning strategies to improve student learning outcomes.

3.2 Inferential Analysis

Inferential analysis is used to determine the differences in learning outcomes of the control class and the experimental class, before conducting inferential analysis prerequisite tests are carried out, based on the normality test and homogeneity test obtained that the experimental class and control class are normally distributed and homogeneous.
Table 3. Prerequisite test table

| Criteria | X1 | X2 |
|----------|----|----|
| $X_{table}$ | 11.07 | 11.07 |
| $X_{count}$ | 5.20 | 4.40 |
| $F_{table}$ | 1.86 | |
| $F_{count}$ | 0.680 | |

Based on the results of the research hypothesis analysis using t-test obtained t value of 5.95300 while the t table at the level of $\alpha = 0.05$ is 2.00172. The results of this analysis provide information that $t_{count} > t_{table} = 5.95300 > 2.00172$. Thus the $H_0$ hypothesis is rejected and $H_1$ hypothesis is accepted, so it can be concluded that there are significant differences in physics learning outcomes of students who are taught using the Blended Learning strategy based on TSOI Hybrid Learning Model with those taught with Blended Learning strategies in Islamic High School of Athirah Bukit Baruga class X MIPA.

4. Conclusion

Based on the results of the study it can be concluded that the application of the Hybrid Learning Model TSOI with Blended Learning approach has a significant influence on student learning outcomes and can support the 21st century learning process. This is similar to research conducted by Purnamawan et al [20] and Suliantari et al [21]. Overall learning outcomes of students taught using the TSOI Hybrid Learning Model with a Blended Learning approach have a high percentage of 83.30%.

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