IRJE |Indonesian Research Journal in Education|
|Vol. 6| No. 2|Dec|Year 2022|

# Improving the Ability of Higher Order Thinking Skills through Information Technology Media in Civic Education Learning

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## Abstract

This research aimed to prove how the Civic education learning process in high school that uses information technology media can increase the ability of higher order thinking skills. Additionally, this research was experimental research that involved manipulating independent variables, controlling external variables, and measuring the effects of independent variables on the dependent variable. There were 20 students for the higher-order thinking skills data for the control class and 20 students for the experiment class. The average value of students' higher-order thinking skills or mean pre-test for the control class was 74, 2500, while for the experiment class was 76, 2500. Meanwhile, the post-test mean for the control class was 80, 5000, while the experiment class was 84.5000. Thus, statistically descriptive, the conclusion is that there is a difference in the average of higher order thinking skills of students between the control and the experiment class.

## Keywords

Citizenship, civics education, higher order thinking skills, information technology, media

## Article History

Received 20 September 2022
Accepted 7 December 2022

## How to Cite

Pebriyenni, Nursi, M., & Muslim. (2022). Improving the ability of higher order thinking skills through information technology in civics education learning. *Indonesian Research Journal in Education |IRJE|*, *6*(2), 445 – 454. https://doi.org/10.22437/irje.v6i2.22120

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## Introduction

As the bearer of reformative and transformative roles, education must be able to prepare students to master various skills. The need for graduates who are critical, creative, communicative, and collaborative is the learning outcome of the 2013 curriculum. Learning outcomes are developed based on needs, curriculum content, and subjects. Civics subjects contribute to the formation of citizenship attitudes, knowledge, and skills. The application of essential principles in Civics learning impacts citizens who are ready to face the 21st century (Sriyanto, 2019). It is appropriate to the Council of the European Union that recommends future competencies that need attention in the education world, such as literacy, multilingual competence: mathematical competence, competence in science, digital competencies, personal, social, and learning-to-learn competencies, citizenship competence, cultural awareness, and expression competences, entrepreneurship (Council of the European Union, 2018).

Citizenship competence is the ability to act as a responsible citizen and fully participate in the community. It requires an understanding of social, economic, legal, and political concepts and structures, as well as sustainable global development (Sriyanto, 2019). For Indonesia, citizenship competence is obtained in Civics subjects at all levels of Education. The 2013 curriculum mandates Civics to be a subject that must instil character in students by developing four core competencies, namely spiritual, social, knowledge, and skill. Civics has a philosophical meaning in preparing civilized and wise citizens (Wibowo & Wahono, 2017). The success of Civics learning will determine the character of law-abiding citizens (a balance of rights and obligations) as the shaper and development of the nation's values and morals in preparing a multicultural mentality (Wibowo & Wahono, 2017).

The Civics curriculum develops dynamically, and learning materials are from four elements of national values, namely Pancasila, the 1945 Constitution, the Unitary State of the Republic of Indonesia (NKRI), and *Bhinneka Tunggal Ika*. These four elements are combined to achieve the four core competencies. In general, the objectives of Civics subjects are to develop the potential of students (1) nationality attitudes including firmness, commitment, and responsibility (civic confidence, civic commitment, and civic responsibility), (2) civic knowledge, (3) civic skills including civic competence and civic responsibility. In particular, Civics subject aims to (1) display characters that reflect the personal and social understanding and practice of Pancasila values and morals, (2) have a supported constitutional commitment by a positive attitude and a complete understanding of the 1945 Constitution, (3) think critically, rationally and creatively and have the spirit of nationalism, love for the homeland, (4) participate actively, intelligently and responsibly as members of society, nation, and state (Sriyanto, 2019).

In essence, the learning process is a process of communication or delivery of messages from the sender to the receiver. In the learning process, the message is in the form of learning material poured into communication symbols, both verbal (words and writing) and nonverbal. It will be obtained by students as knowledge, skills, and values for life. For the message to be conveyed effectively, it requires adequate means or media. The use of

information technology media can create meaningful learning, where students can increase their higher order thinking skills (HOTS).

Students who have HOTS abilities are characterized by being able to: 1) transfer and apply the knowledge and skills they already have to new contexts or more complex ways; 2) think critically, apply wise judgment, or produce reasonable criticism; 3) identify and solve problems in their lives. According to Bloom's taxonomy, there are six cognitive levels, namely, remember (C1), understand (C2), apply (C3), analyze (C4), evaluate (C5), and create (C6). Remembering, understanding, and applying are included in low order thinking skills (LOTS). Meanwhile, analyzing, evaluating, and creating are included in higher order thinking skills (HOTS) (Yahya, Toukal, & Osman, 2012).

**Literature Review**

Schools need to prepare students to face the increasingly complex challenges of the 21st century. Learning is not enough to equip students with the knowledge and simple thinking processes but needs to prepare students to have and be able to develop the essential skills of this century. Thinking is a mental activity that occurs when a person faces a situation or problem that needs solving. The most popular classification or taxonomy in the world of education is Bloom's Taxonomy. There are six (6) levels of thinking processes, including remembering, understanding, applying, analyzing, evaluating, and creating (Yahya, Toukal, & Osman, 2012). Brookhart (2017) categorized the top three cognitive processes in Bloom's taxonomy as higher order thinking skills processes consisting of analyzing, evaluating, and creating as follows:

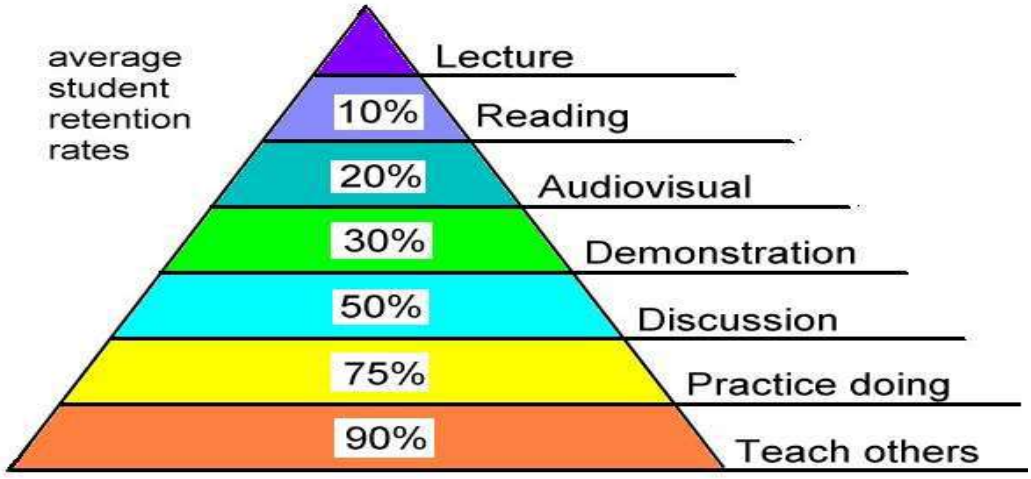
**Table 1.** *The verbs of L3 HOTS*

| | |
|---|---|
| To create | Create own ideas.<br>Verbs: construct, design, create, develop, write, and formulate |
| To evaluate | Make own decision.<br>Verbs: evaluate, assess, refute, vote, support, and decide |
| To analyze | Specify aspects/elements.<br>Verbs: compare, examine, criticize, evaluate |

Source: Ariyana et al. (2018)

The HOTS cognitive level involves creative and critical thinking processes of analysis, evaluation, and creation. Student retention or student comprehension is strongly influenced by the learning activities model by the teacher. Students can only absorb 5% of learning materials if the lecture activities are carried out by the teacher. When learning activities are carried out with peers, the retention power of students reaches 90%.

**Figure 1.** *Learning pyramid*




Research by Eyler and Giles (1999) proved that the effectiveness of learning is influenced by the media used by the teacher. Eyler and Giles (1999) also found that the learning model that is located at the top of the cone, which is learning that only involves verbal symbols through text presentation, is the learning that produces the highest level of abstraction. The most effective learning is learning that is at the bottom of the cone, which is directly involved with purposeful learning experiences. The level of abstraction in this learning model is very low, so it makes the students easier to absorb new knowledge and skills.

A meaningful learning process is needed to create citizens who can adapt to the development of science and technology, the 21st century, and the industrial era 4.0. The problem that is mostly encountered in Civics learning is the lack of information, especially related to the development of law enforcement, political participation, and implementation of civilized values in the life of the nation and state. These problems are assumed to be able to be overcome by utilizing information technology media. It is because learning is always influenced by the development of technological results that can be used for learning needs. Students are learning subjects that play a dominant role so they can move fully, even individually studying the subject matter. Thus, the teacher acts more as a facilitator, managing various sources and facilities for students to learn. Student involvement as learning subjects can improve students' ability to think at higher levels (HOTS). Higher order thinking skills are one of the individual capital to face the real world with increasingly rapid changes (Hanifah, 2019).

## Methodology

This research is quantitative research with a quasi-experimental design. Sugiyono (2013) stated that experimental research is a study that involves manipulating independent variables, controlling for extraneous variables, and measuring the effect of independent variables on the dependent variable. Additionally, Sugiyono (2013) also stated that

experimental research is a method used to find the effect of treatment on others under controlled conditions. By using this design, the experimental class group and the control class group have the same characteristics because they are taken randomly from a homogeneous population. This design has a control group but cannot function fully to control external variables that affect the implementation of the experiment. The design is used if the researcher can exercise control over various influential variables. The effect of the treatment can be known by calculating the average treatment observation results compared to the average observation results without treatment. An explanation of the research design is as follows (Hastjarjo, 2019).

| P | $O_1$ | X | $O_2$ |
|---|---|---|---|

X = Treatment Information; P = Research conducted implementation; $O_1$ = Pre-test results; $O_2$ = Post-test results

The population in this research was students of class XI SMA 4 Padang. Meanwhile, the research subjects were 40 students classified into two groups, with 20 students in the experimental class and 20 in the control class. The students in the experiment class were ten students from each XI MIPA 1 and XI MIPA 2. Additionally, in the control class, there were ten students from each XI MIPA 5 and XI IIS 2. The research was conducted by giving treatment (Information Technology Media) to the experimental class only, while the control class was not given any treatment. The data analysis technique was carried out by the normality test, homogeneity test, and heteroscedasticity test with testing of hypothesis one way ANOVA Test and Wilcoxon Sign Range Test.

## Findings and Discussion

### *Comparison of the level of higher order thinking skills (HOTS) in the control class and the experimental class*

The normality test used is the Kolmogorov-Smirnov method. Below is a complete description of the results calculation of the Higher Order Thinking Skills data normality test of students between the control and experimental class.

**Table 2.** *Normality test*

| Treatment | Q - value |
|---|---|
| Control Class<br>Experimental Class | 0,200 |

Based on the analysis of the normality test, the *Asymp*.Sig. (2-tailed) value in the control and the experimental class was 0.200 because both values are more than the alpha value (α = 0.05) with normality conditions (*Asymp*. Sig. > 0.05). Therefore, the conclusion is that higher order thinking skills data of students in the control and experimental class are normally distributed.

***Homogeneity test,*** the results of the data homogeneity test of the ability to memorize the control and the experimental class are in the table below:

**Table 3.** Homogeity test

| Treatment | ϱ – value |
|---|---|
| Control Class | 0,752 |
| Experimental Class | 0,205 |

From the results of the homogeneity test analysis, the *ϱ - value* for the control class was 0.752, and the experimental class was 0.205. Since this value is greater than the alpha value (α = 0.05) with the condition of homogeneity (Sig. 0.05), the conclusion is that the higher-order thinking skills data of students in the control class and experimental class are homogeneous (same). Thus, it can be concluded that there is no difference in the level of students' higher-order thinking skills between the control class and the experimental class.

***Heteroscedasticity test,*** the results of the heteroscedasticity test of students' higher-order thinking skills data in the control class with the experiment class are in the table below:

**Table 4.** *Heteroscedasticity test*

| Treatment | *ϱ - value* |
|---|---|
| Control Class<br>Experimental Class | 0,000 |

From the results of the analysis of the heteroscedasticity test, *ϱ - value* was 0,000. Since it is less than the alpha value (α = 0.05) with the condition of heteroscedasticity (Sig. > 0.05), it means that the higher-order thinking skills data of students in the control class and experiment class do not show heteroscedasticity symptoms in the regression model. Thus, the conclusion is that there is no difference in the level of students' higher-order thinking skills between the control and experimental class.

***Independent T-test,*** an independent t-test is a method of hypothesis testing in which the data used are free (not in pairs) and normally distributed.

**Table 5.** *Statistics group*

| | Class | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pre-test | 1 | 20 | 74,2500 | 5,19995 | 1,16274 |
| | 2 | 20 | 76,2500 | 5,59017 | 1,25000 |
| Post-test | 1 | 20 | 80,5000 | 3,59092 | ,80296 |
| | 2 | 20 | 84,5000 | 4,26121 | ,95284 |

Based on the table of group statistics output above, the number of students for the control class is 20, and for the experimental class are also 20 students. The average value of students' higher-order thinking skills or mean pre-test for the control class is 74,2500, while for the Experimental class is 76,2500. Meanwhile, the post-test mean for the control class is 80,5000, and the experimental is 84.5000. Thus, statistically descriptive, the conclusion is that there is a difference average of students' higher order thinking skills between the control and

experimental class. Furthermore, to prove whether the difference is significant or not, it is necessary to interpret the output of the independent samples test as follows.

**Table 6.** *Independent samples test*

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | T | Df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| HOTS | Equal variances assumed | 1,664 | ,205 | -3,210 | 38 | ,003 | -4,00000 | 1,24605 | -6,52249 | -1,47751 |
| | Equal variances not assumed | | | -3,210 | 36,939 | ,003 | -4,00000 | 1,24605 | -6,52487 | -1,47513 |

Based on the output above, the value of Sig. Levene's Test for Equality of Variances is 0.205 > 0.05, which means that the data variance between the control and experimental class is homogeneous so that the interpretation of the independent samples test output table above is guided by the values contained in the table of Equal Variances Assumed. Additionally, the above table of independent samples test output in the equal variances assumed section that the value of Sig (2-tailed) is 0.003 > 0.05, so as the basis for decision making in the independent samples T-test, the conclusion is that $H_1$ is accepted and $H_0$ is rejected. Thus, it indicates a significant difference between the higher-order thinking skills of students average in the control class and the experimental class with different abilities. Therefore, the conclusion is that information technology media can increase students' higher-order thinking skills.

Furthermore, from the output table above, it is known that the mean difference value is -4,00000. This value shows the difference between the higher order thinking skills average of students in the control class and experimental class or 80.5000 – 84.5000, and the difference between these differences is – 6.52249 to – 1.47751 (95% confidence interval of the difference lower upper). Based on the research results, the conclusion is that information technology media can increase students' higher order thinking skills in Civics learning in high school.

### *The effect of information technology media on civics learning in senior high schools in improving students' higher order thinking skills*

The statistical analysis results show that information technology media in Civics learning in senior high schools affects the students' higher-order thinking skills, as in the table below.

**Table 7.** *ANOVA*[a]

| Model | | Sum of Squares | Df | Mean Square | F | Sig |
|---|---|---|---|---|---|---|
| 1 | Regression | 1,914 | 1 | 1,914 | 8,993 | ,005[b] |
| | Residual | 8,086 | 38 | ,213 | | |
| | Total | 10,000 | 39 | | | |

a. Dependent Variable: Higher Order Thinking Skills
b. Predictors: (Constant), Unstandardized Residual

The "ANOVA" table above shows that the F-count is 8.993 with a probability of 0.005. Since the probability = 0.05, it means that information technology media is not equal to zero and affects students' higher-order thinking skills. It also means that the value of the coefficient of determination $R^a$ is not equal to zero or significant, so the conclusion is that information technology media is not equal to zero and affects students' higher-order thinking skills. The research results indicate that information technology media affects students' higher-order thinking skills.

Based on the ANOVA test analysis result above, further tests were carried out using the Wilcoxon Sign Range test, as below.

**Table 8.** *Test statistics*[a]

| | Post-test – Pre-test |
|---|---|
| Z | -4,780[b] |
| Asymp. Sig. (2-tailed) | ,000 |

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks

Based on the results of the Wilcoxon Sign Range Test calculation, the Z value is -4.780 with a p-value (Asymp. Sig 2 tailed) of 0.000, where the number is less than the critical level of 0.05, so it indicates that $H_1$ is accepted and means there was a significant difference between the pre-test and post-test groups.

## Conclusion

Based on the research results, the higher order thinking skills data of students in the control and experimental class are normally distributed and homogeneous. There is no difference in students' level of higher order thinking skills between the control class and the experimental class. The average value of students' higher order thinking skills or mean pre-test for the control class is 74,2500, while for the experimental class is 76,2500. Meanwhile, the post-test mean for the control class is 80,5000, and the experimental class is 84.5000. Thus, statistically descriptive, the conclusion is that there is a difference average of students' higher order thinking skills between the control and the experiment class. Based on

the Wilcoxon Sign Range test calculation results, Z is -4.780 with a p-value (Asymp. Sig 2 tailed) of 0.000, where the number is less than the critical level of 0.05. Therefore, the conclusion is that $H_1$ is accepted or means there is a significant difference between the pre-test and post-test groups. Thus, the suggestion is that teachers use information technology media to improve the higher order thinking skills of high school students.

**Declaration of Conflicting Interests**

The authors declared no potential conflicts of interest.

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