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HOTS-AEP-COVID-19 and ILMIZI Model on Primary Education Teacher Candidate: Knowledge of Environment and Coronavirus in Jakarta

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Abstract: 21st Century environmental learning when the pandemic Coronavirus Disease (COVID-19) requires a variety of learning innovations. One of them is learning innovation in Primary Education Teacher Candidate (PETC) using ILMIZI model. That is because solving environmental problems requires knowledge, one of which is Higher Order Thinking Skills (HOTS). Previous research has been carried out on developing a Higher Order Thinking Skills Assessment based on Environmental Problem (HOTS-AEP), then used in this study to be modified into HOTS-AEP-COVID-19. The purpose of this study was to measure students HOTS using HOTS-AEP-COVID-19 and analyze the implementation of the ILMIZI model for PETC. The method used in this research was descriptive using survey techniques. The results of this study indicate that the HOTS score of PETC students measured using HOTS-AEP-COVID-19 is still in the very low category for all students (24.78), Male (23.10), and Female (24.97). Besides, the ILMIZI model can be used in the environmental learning for PETC. The conclusion of this study showed that the HOTS score of PETC students still needs to be improved and it needs to be done learning innovations based on ILMIZI models. This research suggested to develop environmental learning media, student worksheets, and environmental teaching materials based on the ILMIZI model for all students in university or school, not only for PETC students.

Keywords: *COVID-19, ILMIZI model, primary education, teacher candidate.*

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Introduction

Environmental learning in the 21st century requires a variety of abilities to support environmental problem-solving programs. Coronavirus Disease 2019 (COVID-19) was the contextual environmental problem. This pandemic occurs starting from the city of Wuhan in China and spread to all countries in the world and cause many problem on economic, education, and sociology (Sintema, 2020; Su et al., 2020; Tian et al., 2020). COVID-19 spreads through dirty and unsterile environments. This makes the impact of environmental cleanliness also be felt by students, one of them was a Primary Education Teacher Candidate (PETC) student. Students in the PETC group are undergraduate students who study education and after they graduate will become elementary school teachers. An understanding of COVID-19 for PETC was important because it will provide this learning to students in the future.

PETC must be able to solve various environmental problems that arise around their environment to prevent COVID-19. One problem that arises at this time is related to environmental problems related to environmental cleanliness around

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densely populated homes. The problem of poor urban planning will make the quality of the environment low and not good for health (Monfaredzadeh & Berardi, 2015; Rahmayanti et al., 2019, 2020). These environmental problems can be solved by analyzing the various causes. After that, evaluate the problem by giving criticism. Finally, we can provide problem solutions to these environmental problems to be solved. All of these abilities are commonly called Higher Order Thinking Skills (HOTS) that are the learning needs of the 21st century (Boholano, 2017; Heong et al., 2012; Ichsan & Rahmayanti, 2020; Saputri et al., 2019).

HOTS is a capability needed in the 21st century because of this ability to solve problems (Ichsan et al., 2019; Imamura, 2017; Tajudin & Chinnappan, 2016). Students with HOTS ability will be able to more easily adapt to face technological advances in the 21st century. Learning in the 21st era, students must be able to use technology as a form of innovation progress in the field of education. HOTS in this case can be trained by using various learning tools such as learning media, student worksheets, and also teaching materials. Various environmental topics can also be presented in order to strengthen students HOTS. Learning tools in this case play a role to strengthen student understanding.

Previous research has carried out the development and implementation of an instrument called Higher Order Thinking Skills Assessment based on Environmental Problem (HOTS-AEP) for all levels of education (Ichsan et al., 2019). This instrument was to measure students' HOTS ability for various environmental problems. The results of the HOTS-AEP implementation showed that the students HOTS score, in general, is still in the low category (Ichsan et al., 2019). This showed that students' knowledge still needs to be improved. Besides, other relevant research has been carried out to improve students' HOTS. This made research on HOTS needs to be further developed. The HOTS-AEP instrument can be modified to focus on COVID-19 so that instrument called HOTS-AEP-COVID-19.

The emergence of a COVID-19 pandemic that had never been predicted before, resulted in students having to know various concepts about COVID-19. Especially for knowledge in the HOTS. The environmental learning for PETC also becomes important especially for contextual concepts. Contextual topics will make it easier for students to understand various environmental concepts and implement them in the surrounding environment (Cronje et al., 2011; Kartikaningtyas et al., 2018; Purwanto et al., 2020). PETC needs to understand the various concepts related to COVID-19 and their dissemination to ensure education at the elementary school level. Based on this, it is necessary and urgent to measure PETC students' HOTS related to the concept of COVID-19 and the environment, using the HOTS-AEP-COVID-19 instrument to make this research novelty.

In addition to the ability of HOTS measured using the HOTS-AEP-COVID-19 instrument, it is necessary to further analyze the use of the learning model. One of HOTS-based 21st-century learning model innovations that have been developed was the ILMIZI model (Ichsan, 2019). Previous research has been carried out to develop this model and ILMIZI model analysis on context of COVID-19 in general environmental learning (Ichsan et al., 2020). This makes this model an option for further implementation, especially when the COVID-19 pandemic in the PETC student group. The purpose of this study was to measure the ability of students HOTS using HOTS-AEP-COVID-19 instrument. Besides, the purpose of this study was to analyze the syntax, teacher activity, and student activity of the ILMIZI model so that it can be implemented on a large scale.

Method

Research Design

This research conducted in March 2020 during COVID-19 pandemic. This research used descriptive method by survey technique. This research method used to analyzed descriptively for Primary Education Teacher Candidate (PETC) knowledge profile about COVID-19. This research urgent because COVID-19 was the pandemic and still need to be solved, especially to prevent the transmission.

Sample and Data Collection

The sample used in this study was PETC in several universities. PETC in this context was undergraduate students in primary education study programs. Data collected via Google form (online media) from 87 students who were randomly selected using simple random sampling. All samples were college students in the Jakarta city, in Indonesia.

Instrument

The instrument used in this study was the Higher Order Thinking Skills Assessment based on the Environmental Problem of COVID-19 (HOTS-AEP-COVID-19) which was adapted from previous research (Ichsan et al., 2020). This instrument has been declared valid and reliable in previous research. The indicators of this instrument consist of 3 aspects namely analyze, evaluate, and create according to the Taxonomy Anderson et al. (2001).

Analyzing of Data

The instruments used in this study were valid and reliable. Students' HOTS scores on PETC were analyzed descriptively using Microsoft Excel. The results of the data analysis were presented in the form of a HOTS score table. After the analysis carried out the categorization of the HOTS score is following Table 1.

Table 1. Students HOTS score categories measured using HOTS-AEP-COVID-19

Category	Interval Score
Very High	X > 81,28
High	70,64 < X ≤ 81,28
Moderate	49,36 < X ≤ 70,64
Low	38,72 < X ≤ 49,36
Very Low	X ≤ 38,72

Source: HOTS Category adapted from Ichsan et al. (2019)

In addition to analyzing the HOTS score, this study also carried out further analysis of the ILMIZI model syntax (learning stages). This model had six syntaxes from identify problems, Limitation problem, Make mind map, Interpret result, Analyze Result, Interaction and evaluate (Ichsan, 2019; Ichsan et al., 2020). The syntax was described in the form of lecturer activities and student activities for PETC students. It also details with a duration of use for each of the learning stages to clarify the lecturer in applying the model.

Results

The results showed that the HOTS of PETC score was in the very low category with raw score of 13.86 for the Male and 14.98 for the Female. This showed that the environmental learning that is studied in classes cannot present contextual learning. That is because the current environmental learning becomes contextual if a concept is given about COVID-19. In more detail, the results of students HOTS scores (All students, male students, female students) can be seen in Table 2.

Table 2. Average HOTS of PETC scores measured for each item

No	Item	All	Male	Female
1	Analyzing the environmental factors that cause COVID-19 increases the spread	2.33	2.00	2.36
2	Analyzing environmental problems that contribute to the spread of COVID-19	2.16	1.86	2.19
3	Give your opinion and criticism of the community's environmental behavior in the spread of COVID-19	2.72	2.43	2.75
4	Give your criticism and suggestions on community behavior in minimizing the impact of COVID-19	2.40	2.00	2.44
5	Make ideas about efforts to reduce the impact of the spread of COVID-19 in the environment around the house	2.26	2.14	2.28
6	Make a simple manuscript about the relationship between the importance of protecting the environment and the spread of COVID-19	3.00	3.43	2.96
	Raw Score	14.87	13.86	14.98
	Score (Interval 0-100)	24.78	23.10	24.97
	Category	Very Low	Very Low	Very Low

In addition to being measured for the average score of each item, the HOTS score is also measured for each indicator. The results of the measurements showed that the indicator with the lowest score is in the Analyze (C4) aspect (in more detail, view Table 3). This showed that the score and ability of PETC students in analyzing a problem are still relatively low.

Table 3. Average HOTS of PETC scores measured for each indicator

Aspect	Indicator	All	Male	Female
C4	Analyzing environmental problems causing the transmission of COVID-19 is increasingly widespread	2.25	1.93	2.28
C5	Evaluate community behavior in protecting the environment in the context of COVID-19 prevention	2.56	2.21	2.59
C6	Creating solutions for environmental problems to prevent COVID-19	2.63	2.79	2.62

As for one of the solutions from the low HOTS can be done by changing the learning model used. One model that has the potential to increase students' HOTS is the ILMIZI model. This model has previously been developed and implemented on a small scale. ILMIZI as an innovative learning model has great potential to improve HOTS of PETC. The syntax,

lecturer activities, and students' activities in learning about COVID-19 can be done as follows (view Table 4). Syntax was refers to ILMIZI model from Ichsan (2019). Then, lecturer activity and students activity based on analysis.

Table 4. Syntax, Lecturer Activity, PETC Students Activity

No	Syntax	Lecturer Activity	Students Activity	Duration
1	Identify problem	Lecturer gives direction to PETC students for identify environmental problems related to COVID-19 through e-learning media	PETC students write a variety of issues about COVID-19, start from problems in the campus environment, school environment, to the home environment. Especially to strengthen the course of education at the elementary school level	10 minutes
2	Limitation problem	Lecturer asks PETC students to solve problems related to the implementation of environmental education in elementary school level related to COVID-19	PETC students write and limit the problems of various problems that have been stated before	10 minutes
3	Make mind map	Lecturer asks PETC students to make a mind map to find a flow and effect of a COVID-19 problem, especially for the education at the elementary school level	PETC students make a mind map following their creativity. The mind map created is related to various environmental factors that cause COVID-19 and its impact on learning at the elementary school level	40 minutes
4	Interpret result	Lecturer asks PETC students to interpret the results of mind maps that have been made related to learning at the elementary school level	PETC students do the interpretation of the results of Mind maps that have been made. The results are written should focus on discussing COVID-19 and its various problems in learning at the elementary school level	10 minutes
5	Analyze Result	Lecturer asks PETC students to conduct further analysis of the mind map, the analysis made must be detailed and in-depth related to COVID-19 learning at the elementary school level	PETC students analyze the results of discussions and make mind maps that have been made before, and write a deeper analysis	10 minutes
6	Interaction and evaluate	Lecturer asks PETC students to upload his work to his friends to be presented further in e-learning, then his friends give responses to various obstacles of COVID-19 learning at the elementary school level	PETC students upload their work in e-learning media. Then interacting by giving comments related to mind maps that have been made, especially in terms of various obstacles to learning COVID-19 in elementary schools	40 minutes

In addition to using the ILMIZI model for implementation in the environmental learning, further, development needs to be done to support learning using ILMIZI. Based on result of analysis learning tools that can be developed are learning media, student worksheets, and teaching materials that are developed following the ILMIZI model. The details of the learning tools that can be developed can be seen in Table 5.

Table 5. Type of Learning Tools can be developed based on ILMIZI model

No	Type of learning tools	Innovation based on ILMIZI
1	Learning media	Learning media that can be developed is to make a contextual concept which contains ILMIZI syntax in the learning media. This learning media can be develop for PETC students and general students at another program in university and school level.
2	Students Worksheet	Students can be asked to work on students' worksheets developed based on ILMIZI syntax, PETC students will be able to use these students' worksheets for themselves. Besides, PETC will be able to use it for learning in elementary schools. Then, this students worksheet can be develop for general students at another program in university and school level
3	Teaching Material	Teaching materials that are developed based on HOTS. The core that must be developed in teaching material is related to contextual learning material that can be used by PETC for teaching in class. Beside that, this teaching material can be develop for general students at another program in university and school level.

Discussion

The results of this study indicate that the HOTS score is still low in terms of COVID-19. This low HOTS score causes PETC understanding to prevent COVID-19 need to be increased. Besides, this understanding must also be accompanied by the implementation of environmental behavior to prevent the spread of COVID-19. PETC students must learn various concepts about COVID-19 and must also be able to have plans to apply learning to elementary school students in the future. Lectures to learn COVID-19 can be done by lecturers to PETC students with e-learning systems. This system will make it easier to deliver learning material remotely (Farisi, 2016; Gampell et al., 2017; Leeuw et al., 2016; Nugraini et al., 2013; Snake-Beings, 2017).

One of the problem solutions that can be used to increase the HOTS of PETC students while the COVID-19 pandemic is the ILMIZI model. E-learning can be done anywhere for PETC students during COVID-19. The application of ILMIZI for PETC students can also be done anytime and anywhere. That is because based on a descriptive analysis of the ILMIZI syntax, it was found that this model was compatible with the e-learning system. PETC can also be taught various concepts using this model. The Lecturer acts as a facilitator of e-learning. This is following student center-based learning (Boholano, 2017; Srisumra et al., 2014; Tsai et al., 2015; Tyabaev et al., 2015). Lecturer directs PETC to be able to search for various issues related to COVID-19 in their environment, then they discuss it in the e-learning group.

Discussion activities will make students accustomed to expressing their opinions. This is the following 21st-century abilities that students need to have, one of which is communication skills (Anagun, 2018; Boholano, 2017; Chalkiadaki, 2018; Kivunja, 2015; Reyna et al., 2018; Wolfson & Funke, 2014). This ability will be trained by conducting various discussions and exchanging opinions among colleagues. This capability is facilitated to be improved in the last syntax of the ILMIZI model, namely interaction. This indicates that the ILMIZI model has a syntax suitable for improving 21st-century learning. Included in this case was the environmental learning for PETC.

Learning Innovation during a COVID-19 pandemic becomes an important thing to do. In addition to using the ILMIZI model for PETC student learning, learning tools need to be developed to support the implementation of learning following HOTS capabilities. Three learning tools can be developed, namely learning media, student worksheets, and teaching materials. These three learning tools will be used to support the environmental learning in the pandemic COVID-19. Innovations like this are important for 21st-century learning (Ito & Kawazoe, 2015; Miarsyah et al., 2019; Parkin et al., 2012; Reyna et al., 2019; Sandberg & Ohman, 2011; Sharif & Cho, 2015).

Conclusion

Based on the results of the study it was found that the HOTS score of students measured using HOTS-AEP-COVID-19 was in the very low category. HOTS score for all students (24.78), male students (23.10), female students (24.97). This showed that the innovation of the environmental learning in PETC must be done one of them by implementing the ILMIZI model. HOTS is an ability that is needed to solve problems and according to 21st century. Students with higher HOTS ability will be able to adapt to competencies in this era of technology. PETC in this context must able to solve the environmental problem using their HOTS ability.

Suggestion and Limitation

Suggestion for future research that other innovations must also be made to support the implementation of the ILMIZI model in all levels of education. This research suggested to develop various environmental learning media, student worksheets, and environmental teaching materials based on the ILMIZI model for all students in university or school level, not only for PETC students. This model can be implement on PETC for various environmental topics. It is also advisable in the further research to develop various tools related to the ILMIZI model for improve HOTS in relevant topics. The limitation of this study is related to the limited number of samples so it is necessary to do further measurements with more samples/larger scale in future studies.

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