

Research Article

Vocational students' HOTS and HOTSEP overview in developing ITA learning model



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ABSTRACT

Practical learning activities carried out in remote situations during the COVID-19 pandemic triggered vocational students to take advantage of the surrounding environment as a learning resource. The process also determines how their HOTS and HOTSEP are. A learning model that can accommodate the skills is needed, such as ITA (Identify problems–Think and write–Analysis and argumentation) model. This learning model utilizes environmental issues intending to guide students to understand the environment through an online platform. This study aimed to analyze the HOTS and HOTSEP of vocational students, as the basis for developing a new learning model. The research sample consisted of 61 students with 29 male students and 32 female students. The sample was selected by simple random sampling. Data were analyzed using descriptive analysis. The results showed that the total scores of students' HOTS (17.14) and HOTSEP (18.74) were suggested as very low categories. Thus, the students' skills need to improve actively with innovative learning models, such as the application of the ITA model.



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INTRODUCTION

All objects and phenomena that enable the learning process for students are defined as learning resources (Abidinsyah et al., 2019; Ho & Yao, 2018; Lewinsohn et al., 2014; Mon et al., 2016). The environment is one of them. This environment can affect all aspects of learning, especially students. When students take advantage of the environment as a learning resource, they will understand the material better. They can also experience meaningful learning because they directly experience real situations or events. Utilization of the environment in the learning process becomes interesting because it is contextual (Madhuri et

al., 2012; Taurina, 2015). Especially during the Coronavirus Disease 2019 (COVID-19) pandemic, appropriate learning innovations are urgently needed (Cutri et al., 2020; Kidd & Murray, 2020; O'Brien et al., 2020).

The COVID-19 pandemic had a major impact on the ongoing learning process that occurred for students in Indonesia, including vocational students. Before the COVID-19 pandemic, they were able to do practical work directly. However, after the pandemic, all learning activities must be done online. This is explained in the Regulation of the Minister of Education and Culture Number 33 of 2019 concerning the Implementation of the Disaster Safe Education Unit Program. Learning activities are carried out by providing protection and safety for students, educators, and education staff from disaster risk and ensuring the continuity of education services in disaster-affected educational units. Therefore, practical activities must also be carried out online. To facilitate these activities, the use of the environment around students is the best choice to do.

Utilization of students' surrounding environment as a learning resource provides benefits but also challenges. Teachers must be able to choose appropriate phenomena for learning, such as environmental problems. The most common environmental issue is the accumulation of waste. The habit of using single-use products affects the accumulation of waste, both biodegradable and non-biodegradable. Lack of waste management has an impact on environmental pollution. On the other hand, human behavior is one of the main components that play a role in environmental conservation (Chouhan et al., 2017; Istiana & Awaludin, 2018; Lai & Cheng, 2016; Meyer, 2016; Runhaar et al., 2019). Students become one of the agents who must participate in environmental conservation (Börner et al., 2015; Ferreira, 2012; Huang et al., 2019; Sivamoorthy et al., 2013). Therefore, learning by utilizing the environmental issues will make it easier for students to gain knowledge and awareness to conserve the environment.

In addition, online learning requires students to continue to hone their HOTS. Higher Order Thinking Skills (HOTS) are students' skills in analyzing, evaluating, and making solutions to a problem (Anderson et al., 2001). HOTS plays a role in training students' thinking to be able to solve problems with various innovative solutions, this is what makes HOTS important to be improved (Belecina & Ocampo, 2018; Ichsan & Rahmayanti, 2020a; Pedrosa-de-Jesus et al., 2014; Zhang et al., 2020). In addition, during the COVID-19 pandemic, students are required to be creative and think critically in managing online learning. Utilization of the environmental issues as a learning resource will require more specific thinking, namely High Order Thinking Skills of Environmental Problem (HOTSEP). HOTSEP includes criticizing problems, providing solutions, and developing innovations related to environmental issues (Ichsan & Rahmayanti, 2020a). HOTSEP is a more contextual level of thinking because it focuses on measuring innovation development to the highest level (C6). The lower level includes students providing problem-solving (C5) and the lowest level is related to criticizing problems (C4) about the environment (Ichsan & Rahmayanti, 2020a). These three aspects of thinking are suitable for 21st-century learning.

Some researchers say that appropriate learning models are needed to train students' abilities in the 21st century (Chalkiadaki, 2018; Demiral, 2018; Garcia, 2015; Kinslow et al., 2018). HOTSEP and HOTS require improvement efforts, especially in the learning environment for vocational students. To accommodate students' HOTS and HOTSEP, a contextual learning model that can take advantage of the environment is needed, namely the ITA model. The ITA learning model which consists of Identify problems–Think and write–Analysis and argumentation is expected to be suitable for learning activities, especially during the COVID-19 pandemic. It is known that a great learning model contains learning innovations that can solve various problems using students' critical thinking (Ichsan & Rahmayanti, 2020b). The ITA learning model can be in the form of teaching model that contain content or topics related to the environment for vocational students. This research is the initial research of the development of the ITA model. The purpose of this study was to analyze the HOTS and HOTSEP of vocational students as the basis for developing integrated teaching model using the ITA model for environmental learning.

METHOD

The research was carried out at one of the Vocational schools in Jakarta in April 2021. The sample comprised 61 students in tenth grade consisting of 29 male students and 32 female students selected using simple random sampling. The research questionnaire used Google Forms. The instrument was distributed to respondents using various social media ranging from WhatsApp, email, and various other applications. Data were then collected and analyzed. The research variables measured were students' HOTS and HOTSEP. The HOTS instrument indicators used in this study were referring to (Anderson et al., 2001). There are six questions developed from the HOTS indicator as presented in Table 1. The interval score for the instrument used is 0-10.

Table 1. Table of HOTS aspect and indicators

Aspect	Indicator	Question number
C4 (Analysis)	Analyze the impact of waste produced from practicum activities	1 and 2
C5 (Evaluation)	Evaluate the 4R principle, namely Reduce, Reuse, Recycle, and Replace	3 and 4
C6 (Create)	Create a garbage bin and flower pot from recycled materials and put it at school or home	5 and 6

Furthermore, the HOTSEP instrument used in this study was developed from the indicators proposed by [Ichsan and Rahmayanti \(2020a\)](#). Six questions were developed to measure the three HOTSEP indicators, as described in [Table 2](#). The instrument used has a score interval of 0-10. The HOTSEP descriptive analysis using Microsoft Excel aimed at measuring student knowledge in the environmental learning context. The data were analyzed descriptively using the HOTSEP categorization (very high, high, medium, low, and very low) with reference to [Ichsan and Rahmayanti \(2020a\)](#), as shown in [Table 3](#).

Table 2. Table of HOTSEP aspect and Indicators

Aspect	Indicator	Question number
C4 (Criticize)	Criticize air and water pollution problems	7 and 8
C5 (Provide solution)	Provide solutions to flood disaster around their house	9 and 10
C6 (Develop innovation)	Develop ideas to cope with garbage accumulation	11 and 12

Table 3. HOTSEP categories in environmental learning

Category	Interval of Students' HOTSEP score
Very high	$X > 81.28$
High	$70.64 < X \leq 81.28$
Moderate	$49.36 < X \leq 70.64$
Low	$38.72 < X \leq 49.36$
Very Low	$X \leq 38.72$

In addition, this study was also observed the learning media use that was measured using a questionnaire. The questionnaire consists of five questions that developed based on four indicators ([Table 3](#)).

Table 3. Learning media indicators

Indicator	Question number
Environmental learning media used are suitable to learning objectives	1
Environmental content taught uses digital-based learning media	2
Environmental learning media are routinely used	3
Utilization of technology-based learning media as long as it is suitable to current development	4 and 5

RESULTS AND DISCUSSION

The results of collecting student HOTS data are listed in two tables. The first ([Table 4](#)) describes the students' scores on each question, while the other table ([Table 5](#)) shows the scores for the measured HOTS aspects. The results showed that the HOTS scores of vocational students were in the very low category. This is shown in all questions that score less than 3.5. The lowest score on items regarding waste analysis from practicum activities for making building components.

Table 4. Average HOTS score for each item (question)

No.	Items	Total	Male student	Female student
1.	Analyze waste from practicum activity in the making of building components	2.34	2.10	2.56
2.	Analyze waste from wood practicum activity	3.05	2.93	3.16
3.	Evaluate 4R in daily activities at home	2.70	2.41	2.97
4.	Evaluate 4R in practicum activities at school	3.34	2.93	3.72
5.	Concept of making a garbage bin and flower pot from recycled materials at school	3.02	3.14	2.91
6.	Concept of making a garbage bin and flower pot from recycled materials at home	2.69	2.69	2.69
Average Score		2.86	2.70	3.01
Score		28.6	27.0	30.1
Category		Very low	Very low	Very low

Table 5. Average HOTS score for each aspect

No.	HOTS aspect	Total	Male student	Female student
1.	C4 (Analysis)	2.69	2.51	2.86
2.	C5 (Evaluation)	3.02	2.67	3.34
3.	C6 (Create)	2.85	2.91	2.80

Similar to the acquisition of HOTS scores, the HOTSEP scores of vocational students are also included in the very low category. Table 6 shows the scores on each HOTSEP question, while Table 7 shows a summary of each aspect. The score obtained for all HOTSEP questions is below 3.8 which indicates a very low category. Question number two that got the lowest score was about the response of people using detergents and disposing of their waste carelessly.

Table 6. Average HOTSEP score for each item (question)

No.	Items	Total	Male student	Female student
1.	Criticize people behavior who use polluted vehicle for close distance	3.28	3.24	3.31
2.	Respond to people who use detergent and throw its waste carelessly	2.28	2.07	2.47
3.	Provide solutions to overcome blocked drainage that causes puddles around the residence	3.26	3.28	3.25
4.	Provide solutions so that people are willing and able to make bio pore in their yard	3.61	3.41	3.78
5.	Develop innovative ideas to cope with waste, such as mask during the COVID-19 pandemic, to prevent waste accumulation	3.28	3.62	2.97
6.	Develop creative ideas to invite the communities for not using plastic bags	3.03	2.69	3.34
Average		3.12	3.05	3.18
Score		31.2	30.5	31.8
Category		Very low	Very low	Very low

Table 7. Average HOTSEP score for each aspect

No.	Aspect	Total	Male student	Female student
1.	C4 (Criticize)	2.78	2.65	2.89
2.	C5 (Provide solution)	3.43	3.34	3.51
3.	C6 (Develop innovation)	3.,15	3.15	3.15

The results of the HOTS and HOTSEP measurements showed the same category, which was very low. The HOTS measurement obtained a score of 28.6, while the HOTSEP measurement was 31.2. Based on Table 4 and Table 6, female students' HOTS and HOTSEP scored higher than male students. However, both female and male students were still in the very low category. Of the three aspects of HOTS measured, aspect C4 (analysis) obtained the lowest score (Table 5). The C4 (critical) aspect of students' HOTSEP also occupied the lowest score (Table 7). The facts obtained show that the empowerment of HOTS and HOTSEP on vocational students is still very limited. Whereas vocational students are expected ready to work when they graduate. So, they need to be prepared with appropriate ability. Moreover, nowadays the competition in finding a job is very fierce. Therefore, it is very important to provide them with 21st-century skills, such as HOTS and HOTSEP. These HOTS and HOTSEP skills are necessary and relevant to the 21st-century educational demand. The expectation is that in the 21st-century students could obtain information from the internet and then create various ideas and implement them to solve problems (Chen & Chou, 2015; Dwyer et al., 2014; Fujii, 2016; Reyna et al., 2018; Yusnaeni et al., 2017).

Aspects of HOTS that students must possess include analyzing, evaluating, and creating. In the aspect of analysis, students' HOTS can be improved by using learning models or media that stimulate students' analytical skills (Hugerat & Kortam, 2014; Husamah et al., 2018; Nugraini et al., 2013; Saputri et al., 2019). The learning model must be able to direct students to define and explore environmental problems in more detail. When they analyze problems, they can provide arguments and critiques of environmental issues. It is considered as an evaluation aspect. Then, students implement their solutions by creating ideas to tackle environmental problems.

The low level of vocational students' HOTS and HOTSEP can also be caused by the inappropriateness of the model and learning media applied. The results of the survey related to the learning media used by vocational students are described in Table 8. Table 8 shows the results of student responses to the learning media that have been used so far. There are 59.01% of students revealed that some teachers have

implemented environmental learning media following its objectives. Then, 65.57% of students stated that some teachers had implemented learning media that supported their analytical skills (question number 2). Regarding question number 3, 73.77% of students guess that all teachers apply technology-based learning media in the learning environment. In question number 4, 60.65% of students stated that all teachers had implemented digital media in environmental learning. Finally, in question number 5, 63.93% of students believe that some teachers have implemented modern learning media. The questionnaire result showed that utilization of technology-based learning media that supports HOTS empowerment is still not optimal.

Table 8. The questionnaire results related to used learning media

Indicator	Question number	Students' response (%)		
		Not yet	Already in a part	Already
- Environmental learning media used are suitable to learning objectives	1. Percentage of learning media utilization according to its objectives	0	59.01	40.99
- Environmental content taught uses digital-based learning media	2. Learning media to support analytical skills	0	65.57	34.43
- Environmental learning media are routinely used	3. The utilization of technology-based learning media	0	26.23	73.77
- Utilization of technology-based learning media as long as it is suitable to current development.	4. The utilization of digital media for environmental learning	0	39.35	60.65
	5. Easiness to understand content using modern learning media	1.64	63.93	34.43

Vocational teachers could design learning that leads students to perform a variety of creative activities containing high order thinking skills so that they could possess the main aspects. The learning can be developed by integrating ITA model (Identify problems–Think and write–Analysis and argumentation). The ITA model is suitable for vocational students as most of them receive productive content. The practical activities require students to think critically in creating skills according to their department. Students must solve problems of how to process waste produced from the practical activities. The ITA model-integrated learning media make learning easier to implement to improve students' HOTS and HOTSEP (Ichsan & Rahmayanti, 2020a). The ITA model is a means to improve HOTS and HOTSEP abilities because it has a variety of more operational learning steps. This is important because more operational learning steps will make it easier for teachers to carry out learning and improve students' various abilities. The development of ITA model-integrated learning media will be an innovation for vocational teachers in providing environmental education to the students.

Teachers, as a spearhead of change, must update their skills to keep up with current development. Teachers should be more creative and innovative in presenting subject content. The productive, creative, and innovative student can be promoted by implementing applicative learning in various scopes by using critical and creative thinking skills, especially in environmental topics. During the pandemic Covid-19, teachers must be creative in teaching and learning activities to achieve the learning objectives (Carrillo & Flores, 2020; Cutri et al., 2020; Flores & Swennen, 2020; Girik Allo, 2020). Therefore, the integration ITA model is an innovation in environmental learning that can be utilized in vocational education. The to-be-developed teaching kits will have a digital base to facilitate access to online learning implementation. This is due to the online learning that will make it vocational students easier to understand the environment during the pandemic. The learning model developed must be accompanied by other complementary media to support learning. One of them is a working sheet containing guidelines for learning (Fajaraningtyas et al., 2019; Khoiriyah & Husamah, 2018; Lee, 2014; Utami et al., 2016). The diverse learning media is necessary for learning (Hidayati et al., 2021). Mainly media developed based on the HOTS indicator to simplify HOTS, also included HOTSEP.

CONCLUSION

This study concludes that the HOTS and HOTSEP scores of vocational students in environmental learning **are very low. Therefore, efforts to improve the students' skills are necessary by developing ITA learning model-integrated teaching kits for environmental learning.** Vocational teachers will have various options of environmental learning media as the to-be-developed teaching kits is an innovative media.

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