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Electronic Student Worksheet Based on Ethnoscience Increasing HOTS: Literature Review

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Article Info

Keywords

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Abstract

Learning in the 4.0 era requires students to be able to have high-order thinking skills, known as higher-order thinking skills (HOTS). This higher-order thinking skill requires a regular and contextual practice process. One of the media that can be used to train HOTS is Student Worksheets as a practicing medium while contextual can be obtained from the contents of Ethnoscience-based Student Worksheets. The Student Activity Sheet is a companion material in the learning process which will make the interaction of lecturers and students more effective, the material becomes easier to understand, and students are more active in critical and creative thinking so that HOTS can be achieved. Online learning in line with the 4.0 era requires learning media, one of which is Student Worksheets arranged in electronic form. This research method is a literature review as an initial stage (preliminary research) of the ethnoscience-based electronic student worksheet development design using the Plomp model. The purpose of this study is to discuss ethnoscience-based student worksheets about practicing HOTS in students. The results of the literacy study show that Student Worksheet is very suitable for online learning and ethnoscience-based material can be used to practice high-level thinking skills in students.

Keywords: electronic student worksheets, HOTS, ethnoscience, era 4.0, online learning

Introduction

The industrial era 4.0 emphasizes the speed of information processing (Schlechtendahl, et. al, 2015). The disruptive era is an integration of Cyber-Physical Systems (CPS) and the Internet of Things and Services (IoT and IoS). Era 4.0 is a time where all lines of life are required to shift towards internet-based digitalization. Education in the 4.0 era also experienced a shift from conventional (offline) to internet-based online learning, known as online learning (online). One of the benefits of the industrial era 4.0 in the perspective of the world of education is a period where educators and students can communicate with each other quickly and in real-time at any time by utilizing internet technology and CPS to achieve learning goals (Prasetyo & Sutopo, 2018)

Online learning requires digital-based media so that it can be accessed from anywhere easily. Online learning enables teaching and learning activities between lecturers and students from their respective residences without having to physically meet each other (offline). However online learning has various challenges. In online learning, the seriousness of students participating in learning cannot be controlled by the lecturer. Lecturers also cannot monitor the attitudes and behavior of students during the learning process and in doing lecture assignments (Sadikin, A., & Hamidah, A., 2020). Students have a lot of difficulties understanding lecture material in online learning because the teaching materials provided by lecturers are difficult to learn independently (Sadikin, A., & Hakim, N., 2019).

The problem in online learning requires the availability of a lecture companion material that makes it easier for students to carry out learning activities and understand the material. One of the learning media that is commonly used to assist lecturers in guiding students' activities and understanding the material is student worksheets. Student worksheets can be used to increase student activity during learning because student worksheets contain assignments and material related to natural events that can be studied and expressed through experiments (Fitriani, 2019). Student worksheets are sheets containing assignments that students must do to master certain competencies in learning (Eurika, 2013). In the current online learning period, student worksheets are also required to be arranged in electronic form.

Student worksheets contain learning materials and activities that greatly support online lectures. The use of student worksheets can help students to be more active and practice higher-order thinking skills (HOTS) (Kadarisma, Sari, & Senjayawati, 2020; Kristianingsih & Wijayati, 2016; Utari et al., 2017).

High-order thinking skills (HOTS) are thinking skills that have reached the creative and critical stages, not only at the level of remembering (Utari et al., 2017). Higher-order thinking skills can be trained by providing contextual materials and activities based on local culture (ethnoscience) (Rohmiyatul Wahda & Sudibyo, 2018). Ethnoscience-based learning uses facts that occur in the community to be associated with scientific science material and knowledge (Indrawati, 2017).

Based on the description above, the purpose of this article is to explore ethnoscience-based electronic student worksheets to practice higher-order thinking skills (HOTS) in students in online learning.

Method

This research is a literature study with a qualitative descriptive method. This study examines the results of other research that are relevant and support the topics discussed so that it will produce a research framework (Ramdhani & Ramdhani, 2014).

Data analysis begins with collecting various relevant and supportive sources to be used as a reference for the study. Scientific articles used as reference sources are selected by researchers based on their closeness to the topics discussed.

The method used in writing this article begins by selecting keywords for reference searches on Google Scholar. The keywords in the search for articles used were "student worksheets, ethnoscience, high-order thinking skills (HOTS), critical thinking, online learning, era 4.0". The inclusion criteria were student worksheets based on ethnoscience, critical thinking, and HOTS. The search for reference articles was limited to the last 10 years and were journal articles that met the inclusion criteria.

Results and Discussion

Search results for articles for references based on specific keywords according to the topic discussed were not available, so we searched for the keywords closest to the problem that will be discussed in this article and 175 related articles were obtained. The search results were then narrowed into a more specific direction with a duration of the last 10 years so that 42 related articles were obtained. These results are still not in line with the topics to be discussed so it needs re-screening. The final filtering is done by reading the abstract of articles obtained related to the topic to be discussed to provide sharper reference results. The results of this last screening found only 8 articles that were closest to the topic to be discussed, but from these five references, only 1 was the most relevant.

Based on the five most relevant articles, a conclusion can be drawn that learning using teaching materials or guiding materials for student activities based on local wisdom (ethnoscience) can play a role in improving critical thinking, creative thinking, and problem-solving. These three thinking skills are included in higher-order thinking skills (HOTS) (Kurniati, 2014; Widodo & Kadarwati, 2013; Dinni, 2018).

Student worksheets that are commonly used by teachers come from various publishers that only contain material, questions, and activities for students. These student worksheets have not been integrated with local cultural wisdom or ethnoscience in the community so that they do not teach students scientific matters that are contextually experienced in their environment. Student worksheets like this cannot accommodate students' critical thinking skills. Therefore, we need a student worksheet that is integrated with ethnoscience so that it can improve critical thinking skills which are one part of higher-order thinking skills (HOTS) (JIR. Astari & W. Sumarni, 2020).

The young generation of the Indonesian nation who lies in students needs to be accustomed to skilled critical thinking in facing the industrial era 4.0 with various technological advances (Saheri et al., 2017). The ability to think critically is one of the 21st-century skills that can be trained using the Problem Based Learning (PBL) learning model assisted by ethnoscience-based student worksheets (Sumarni. W, 2019). Other research results show that the integration of ethnoscience in the learning process can strengthen students' critical thinking abilities (Arfianawati et al., 2016).

A fun learning process requires textbook companion materials in the form of attractive and contextual Student Worksheets (Khotimah et. al, 2018; Septiaahmad et al., 2020). Septiaahmad et al. (2020) argue that Student Worksheets are a medium that can be used to guide students to be more active and able to solve problems in learning physics. Student Worksheets prepared by integrating ethnoscience in the Discovery Learning (DL) model are proven to be able to increase student activeness in learning and critical thinking.

Student worksheets used in learning related to local culture will enable students to train and improve their problem-solving skills. This is because the concepts in learning that are learned by students are following the reality in the environment where they live every day (Khotimah et. al, 2018). Hariri et.al (2016) stated that one of

the teacher's steps to help students understand the concept of science is to integrate local wisdom in the learning process because it will be able to encourage students' higher-order thinking skills, especially in problem-solving. Science learning based on local wisdom is very important because it will provide a more contextual and meaningful discourse of knowledge so that it can foster problem-solving skills in students (Qolbi, et al., 2016). Ethnoscience-based learning will be very much needed by students, especially those who live in rural areas, which are still thick with mystical culture without a scientific basis so that they can open the logical horizons of thinking of the younger generation there so that they can solve problems on the right scientific basis (Muslimin et.al, 2018; Wahyuni. S, 2015).

Ridho et.al (2020) stated that the industrial era 4.0 has opened up many opportunities and challenges. The young generation must be able to use the opportunities that exist and at the same time must be strong in facing all the challenges that confront them. One of the challenges in the descriptive era is the use of ICT in various lines of life. This condition requires students to be proficient in the use of IT accompanied by skills to think critically in facing the times. Learning at this time must also be digital-based so that media, teaching materials, or books that are suitable to be developed are also electronic. However, all things related to digitalization must remain based on ethnoscience because it can improve critical thinking skills in the industrial era 4.0 (Ridho et.al, 2020).

Conclusion

The purpose of this article is to present a literature analysis on student worksheets in electronic form based on ethnoscience related to higher-order thinking skills (HOTS) in students, especially students in online learning in the industrial era 4.0.

The function of the activity sheet is the same as the activity sheet for students in primary and secondary schools so that the literature taken is the result of research on student activity sheets. Student activity sheets that are very suitable for use during the descriptive period with the current online learning model are in electronic form so that they are easily accessible to students from their homes at any time. This also applies to the preparation of student activity sheets so that they are expected to be in digital form.

Ethnoscience-based learning is urgently needed in the industrial era 4.0 so that students understand the material more easily and are contextual and still maintain the preservation of scientific local culture so that it is not consumed by technology and digitization. Various models, methods, media, and teaching materials in learning that are arranged based on local wisdom give results that can improve higher-order thinking skills (HOTS). Electronic student worksheets that integrate science with local wisdom (ethnoscience) are needed because they can train, familiarize and improve critical, creative, and problem-solving thinking skills or it can be concluded that they can help hone higher-order thinking skills (HOTS).

Recommendations

In short, we give the opinion that the integration of ethnoscience in learning in the industrial era 4.0 is very important. Therefore, we provide recommendations:

Recommendation 1: it is necessary to promote learning that is integrated with local wisdom or based on ethnoscience.

Ethnoscience must be incorporated into learning at all levels of education. Ethnoscience can be integrated into learning models, methods, media, or teaching materials such as student worksheets.

Recommendation 2: digitization media and learning teaching materials.

In online learning, electronic media and teaching materials are needed so that they are easily accessible from anywhere and anytime by anyone. This is the demand for the industrial era 4.0 which presents internet-based distance learning. Therefore, it is recommended that the student worksheets that be compiled must also be in electronic form.

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