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Students' Perceptions of The Ethnoscience "Dekke Naniura" Virtual Laboratory

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Abstract— The virtual laboratory implemented in this research is a virtual laboratory based on virtual reality. The virtual laboratory was developed based on the local wisdom of the Batak tribe, "Dekke Naniura." The local knowledge is associated with chemistry and becomes the content of the development of a virtual laboratory. Implementation was carried out on 45 students selected by purposive sampling method. Students are given a perception indicator of 5 indicators with five statements for each. Based on data analysis and interpretation, 77.78% of students thought that the use of virtual laboratories was difficult, 86.67% of students were very enthusiastic about conducting virtual laboratory trials, 53.33% of students felt that laboratory content was very interesting, 57.78% thought that the material contained is very easy to understand, and 62.22% of students believe that the language chosen in the virtual laboratory is very clear. In general, students think the virtual laboratory developed is very helpful for them in the learning process, especially on materials that cannot be practiced in real laboratories. However, students still find it difficult to use virtual laboratories, so continuous training is needed.

INTRODUCTION

A virtual laboratory is a digital product that can solve problems in the learning process, especially in integrated learning laboratories. Many factors influence the practical learning process using a real laboratory in the implementation process. These supporting factors have a relationship with various aspects and tend to influence each other [1]. One of the supporting factors is necessary for the learning process to be carried out [2].

In chemistry learning, the implementation of knowledge in a real laboratory is a fairly complex learning process involving various factors, both the main supporting elements, such as the availability of chemical materials and tools, as well as facilities and infrastructure, such as tables, chairs, and other supporting infrastructure [3]. The availability of supporting factors and infrastructure is a core supporter of the learning process, often the cause of not implementing learning activities. The unavailability of one of the supporting factors, as well as facilities and infrastructure, both in terms of chemical materials and tools and adequate supporting facilities and infrastructure, is a common obstacle that causes the learning process not to be implemented in a real laboratory [4]. The provision of the main factors and supporting infrastructure for real laboratories is a complex problem, especially for educational units that still need to be financially independent. The condition of the main elements and supporting infrastructure for the laboratory requires a large amount of money, and the maintenance process also requires a large amount of money. This funding constraint is a classic problem that is the main cause of not implementing learning activities in the laboratory [5], [6], [7].

In addition to improving the system for providing supporting factors and real laboratory infrastructure, the very rapid development of the digital era can be elaborated to produce creative and innovative products to accommodate learning in the laboratory. However, it is constrained by supporting factors such as the unavailability of tools and chemicals, as well as the unavailability of other supporting facilities and infrastructure. One of the digital products that can be developed to facilitate learning activities in the laboratory is a virtual laboratory based on Virtual Reality (VR) [8], [9]. VR-based virtual laboratories can accommodate practical learning activities and provide laboratory experiences to students even though learning is not carried out directly [10].

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The implementation of a VR-based virtual laboratory can accommodate students to carry out practical activities like activities in a real laboratory [11], [12], [13]. Students are accommodated to carry out actions that can stimulate skills while elaborating the content of learning materials. Through its implementation, students can be facilitated to carry out learning activities even though they are not done directly [14], [15]. However, the performance of VR-based virtual laboratories is not able to accommodate students to experience events that arise in laboratory activities directly [16], [17], [18]. Students cannot be adjusted to experience how a chemical reaction is formed and the effects that arise from the energy produced.

In content development, VR-based virtual laboratories provide great opportunities for elaborating on various content. Environmental-based content and local wisdom of an area can be elaborated into virtual laboratory content if the content follows the concepts and objectives of content development [19], [20], [21]. The development of integrated content of local wisdom is one of the most interesting contents to be elaborated on in a virtual laboratory [22], [23], [24]. People's habits linked to the science field can be used as a source of learning through optimization with a virtual laboratory [25].

METHODS

This study was conducted to determine students' perceptions of using an ethnoscience-based virtual laboratory, which began with implementing the laboratory. Data was collected by giving perception questionnaires to 45 students. The questionnaire consisted of 5 indicators, each with five statements. These indicators include ease of use of virtual laboratories, students' enthusiasm in implementing laboratories, content display, content appropriateness, and language used in virtual laboratories. The virtual laboratory content implemented is the local wisdom of the Batak tribe, "Dekke Naniura," which is associated with chemical materials.

RESULT AND DISCUSSION

The research data were collected by giving perception questionnaires to 45 students. The questionnaire consists of 5 indicators: ease of use of the virtual laboratory, enthusiasm of students in implementing the laboratory, display of content, appropriateness of the content, and the language used in the virtual laboratory. Based on data analysis and interpretation, students' perceptions of virtual laboratories are shown in Fig. 1.

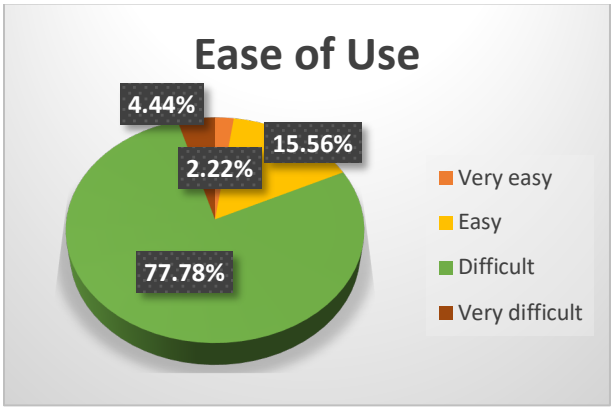

FIGURE 1. Ease of Use

Based on Fig. 1, 77.78% of students find it difficult to use a virtual laboratory, 15.56% find it easy, 4.44% find it very difficult to use a virtual laboratory, and 2.22% find it very easy. In general, most students need help using a virtual laboratory. It is because all students who are the research sample have never used a virtual laboratory before. Therefore, further training or implementations of other relevant research products are needed to improve the adaptations that have been made. Another indicator analyzed in the study is students' enthusiasm for implementing virtual laboratories, as shown in Fig. 2.

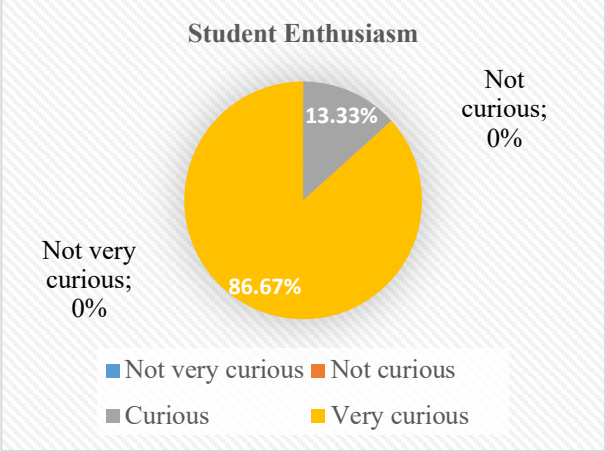

FIGURE 2. Student's Enthusiasm

Based on Fig. 2, 86.67% of students are very curious about the virtual laboratory that will be implemented, and another 13.33% are interested. These data indicate that the research sample shows high enthusiasm for implementing virtual laboratories. This enthusiasm shows that students pay great attention to digital-based innovations. Enthusiasm and curiosity about virtual laboratories are important indicators in implementing virtual laboratories that can stimulate knowledge elaboration. Another indicator analyzed is the virtual laboratory content display, as shown in Fig. 3.

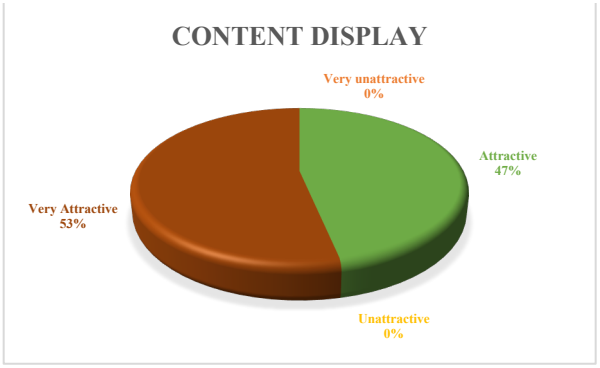

FIGURE 3. Content Display

Based on Fig. 3, 53% of students think the virtual laboratory content is very interesting, and another 47% think it is interesting. These data indicate that innovations made by integrating real activities in virtual laboratories can stimulate students to elaborate on material more optimally. Laboratory content can also be used as an option that can be colored to facilitate practical activities. Another indicator analyzed is the feasibility of virtual laboratory content, as shown in Fig. 4.

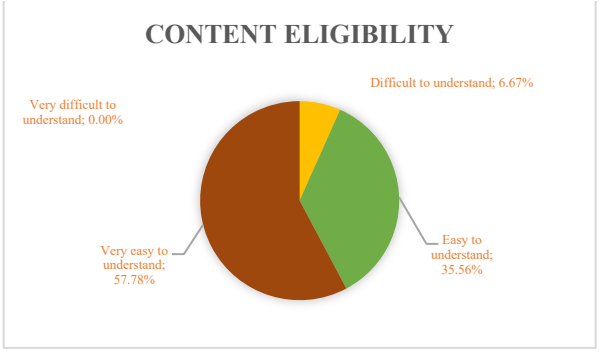

FIGURE 4. Content Eligibility

Based on Fig. 4, 57.78% of students thought that the content contained in the virtual laboratory was very easy to understand, another 35.56% thought it was easy to understand, and 6.67% found it difficult to understand the virtual laboratory content. The data shows that most students find it easy to understand the material and subject matter contained through the integration of the virtual laboratory. However, some students need help understanding the material presented because their skills influence virtual laboratories' implementation. Therefore, continuous training or simulation is required before implementation is carried out. Another indicator analyzed is the virtual laboratory language, as shown in Fig. 5.

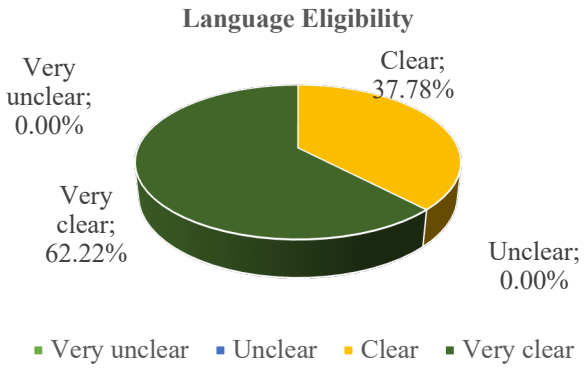

FIGURE 5. Language Eligibility

Based on Fig. 5, 62.22% of students feel very clear regarding the use of language in the virtual laboratory, and another 37.78% feel clear about the terminology used. These data indicate that students do not experience difficulties with the language used in the virtual laboratory. Students understand all the content in the virtual laboratory, and there is a clear understanding of the terminology used.

Virtual laboratories can stimulate students' curiosity and be a laboratory-based learning supplement. Virtual laboratories can be a solution and a medium for learning from material that cannot be done in a real laboratory. With the elaboration of a virtual laboratory, the lack of facilities and infrastructure, as well as the main object in a practicum in a real laboratory, can be anticipated so that the learning process can take place even though the main purpose of the experiments, facilities, and supporting infrastructure is not available. However, a virtual laboratory still cannot replace the role of a real laboratory. Specifically for chemical materials, a real laboratory is crucial, considering that students' skills can be optimally honed through a direct experiment. Ideally, virtual laboratories can be used as learning supplements and can be elaborated more on abstract materials and materials that are high risk if practiced directly.

CONCLUSION

Implementing an ethnoscience-integrated virtual laboratory can stimulate students to understand the learning material more optimally. In general, students welcomed the implementation of the laboratory well. Most students were enthusiastic about the implementation and thought the material contained as laboratory content tended to be easy to understand. Regarding language and content display, most students believe the virtual laboratory language is very easy to understand, and the laboratory display is very interesting to implement. However, in terms of use, most students need help to operate the laboratory. Thus, continuous implementation and simulation of laboratory utilization are required before its performance to optimize implementation.

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