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The schemes of students' understanding through digital argumentation in online learning during pandemic COVID-19

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ABSTRACT

The student conception needed to analyze problems and obtain effective solutions. It is also required to train students to think reflective and argumentative, so expressing student conception is necessary. This research aimed to describe the schemes of students' conception through digital arguments in online learning. This research was descriptive qualitative by uncovering students 'digital arguments and making schemes of students' understanding based on digital arguments presented in written discussions. Research Data were from electronic discussion forums, and unstructured interviews in biology and physics. The analysis results describe that digital argumentation can use to schemes students' conception.

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1. INTRODUCTION

Policies during the COVID-19 pandemic have brought changes in various aspects, one of which is education and the learning process. The face-to-face learning process changes to the online learning process one of the important learning problems is to address student conception [1]–[3]. Students' preconception must be considered in instructional design and curriculum planning [4]. Students' conception is very important to reveal because it is closely related to their ability to evaluate and create in the future and select learning strategies that will give at the next meeting. Effective learning is very important in the current COVID-19 pandemic, given the limited interactions between educators and students [5]. Online learning certainly brings changes in terms of the learning process and evaluation. Put the implementation of discussions that previously face-to-face is changing to a virtual form the expression of argumentations in the form of audio-visual and digital text through the platform used in learning. The arguments in the discussion, which presented in the form of text, audio, digital audio-visual (digital arguments), certainly provide different information from the arguments presented directly [6]–[8].

Arguments are not only the delivery of arguments, but are broader, such as: discussion, persuasion, and disagreement with other people's arguments [9]–[11]. In online learning the arguments are presented in the form of digital text and audio video. In previous research [7], [12], [13], information was obtained that students felt the positive influence of scaffolded argumentation activities on online asynchronous discussions.

Students can express their argument anytime and anywhere without being limited by time. crisis of confidence in expressing opinions can be reduced. Students who have good argumentation skills will express their thoughts in understanding the problem, show logical reasons, explain, and defend their argument [14]. Misinformation has the potential to occur related to the meaning of digital arguments presented in contrast to arguments presented directly through face to face. Arguments conveyed through web meetings are less misinformed than information presented in the text. The lecturer needs to reveal the students' argumentation schemes. The student's conception can reveal from expressing their argumentation.

Learning/topics that are interesting have the opportunity to be discussed and evaluated by participants. The ability of the facilitator to make students ask questions is important in the online learning process. Digital information on students' arguments can be seen in synchronous and asynchronous forums in discussion forums through chat and discussion forums provided in e-learning. Students' conception revealed from the way students convey problems and questioning by peers conveyed by lecturers. The schematic of students' conception can use as a reference for the lecturer in managing subsequent learning.

2. RESEARCH METHOD

The method used in this research is descriptive qualitative by collecting documents: 1) The student discussion process in the form of asynchronous discussion transcripts; 2) Unstructured interviews; and 3) Assignments. Data obtained from two meetings of physics and biology courses online. Here are 11 students taking physics courses and 27 biology students. Purposive sampling is used to select the sample. Sample selection considerations are students who are active in discussing and uploading assignments. Two students who took physics and two students who took biology courses were chosen. To manage the quality of the data, triangulation methods are used, namely the method of collecting discussion data, unstructured interview data and assignments. Triangulation is done to validate active students. If students are actively discussing but not uploading assignments, the data will be reduced (not described and analyzed). the transcripts of the discussion results were synthesized using unstructured interview data and assignments. The discussion transcript synthesis results are in the form of descriptions of students' conceptions, which are then presented in schematic form. The scheme is structured based on students 'initial knowledge, students' conceptual changes in the discussion process, and the final conception.

3. RESULTS AND DISCUSSION

In the first stage, information on the discussion process conducted by students and lecturers will be presented. Lecturers give problems to students, and students give responses to the responses given to test the consistency of the arguments given. In the second stage, the lecturer provides the opportunity for students to respond (evaluation) to discussions delivered by other students. In this second stage, students' critical thinking skills should ideally be seen and able to provide criticism of arguments submitted by their peers. At each stage, the analysis is presented descriptively to profile the student's stages of thinking. The results of stages I and II are presented as follows.

3.1. Stage I. Description discussion of the problems presented by the lecturer

In stage I the lecturer provides general problems and or general knowledge related to the material to be studied. A discussion transcript is presented in Figure 1 for the biology course as follows:

In Figure1, student A can relate biology courses to agriculture in overcoming problems faced by humans. They provide examples of the use of insecticides to treat pests—information regarding the negative impact of insecticide use not studied in depth. From the students' responses, it can be obtained information that students have prior knowledge (preconceptions) about the biology material that they get from everyday life. Student B tries to relate biology based on his experience. Students link biology with diseases in humans. The lecturer tries to dig up information related to students' experiences by asking about the pain they have suffered and how biological scientists deal with it. In his argument, students knew that ulcer disease was caused by eating a lot of spicy food. The treatment that used ulcer medication, and students also knew that ulcers could be treated by drinking ginger, but students did not like it because they did not like it. The results of this discussion provided information that students gained knowledge from direct experience (pain experienced) and information from outside (literature) regarding the use of ginger as alternative medicine. it should be understood that [15] provides information that it is better to make students experience cognitive conflict from directly observed experiments than to reflect on experiences reported from popular papers or writings found on the internet. Figure 2 is a discussion transcript from an online forum for the physics courses.

Figure 1. Discussion of basic problems given by the lecturer of the biology courses

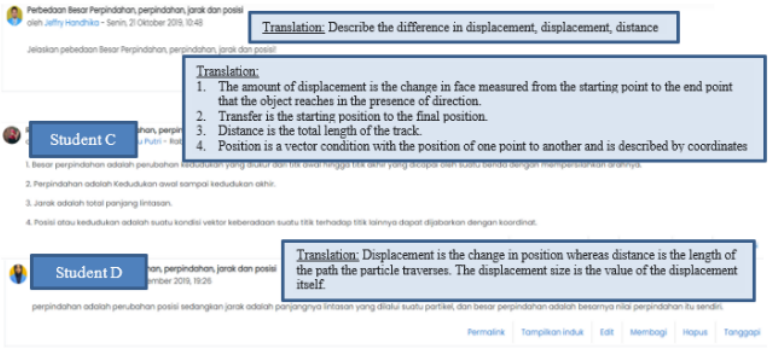

Figure 2. Discussion of basic problems given by the lecturer in physics courses

In the discussion of Figure 2, student C obtained information from the literature related to the concepts of position, distance, and displacement. In physics courses, the implementation of learning is different from biology. In fundamental physics courses, students are reviewing material from various sources. The arguments given tend to be identical to the conceptions presented. Regarding the concept of

displacement, students are still unable to provide accurate information. Information regarding magnitude of displacement rates is difficult to obtain from experiences in everyday life the concept of magnitude of displacement obtained by understanding the language of mathematics and physics well. Students use their initial knowledge regarding displacement and equate the definition of displacement with the magnitude of displacement. Student D gave the right response to the questions given. The difference in response between students C and D related to the source of literature studied and the level of understanding. Problems about distance and displacement have been researched and gave the same results [16], where one of the reasons is that students do not understand the concepts of vector and scalar quantities. For the concept of displacement magnitude, not many researchers have revealed it.

3.1.1. Discussion of description I

Based on Figures 1 and Figure 2, the schematic described that students' preconceptions come from the surrounding environment, experiences, and learning resources. The preconceptions obtained from the surrounding environment tends to provide a varied response. The preconceptions brought from the environment and experiences tend to stick and answered with certainty with simple communication language. Preconceptions serve as a platform on which students interpret their world. Unfortunately, in many cases, the preconceptions obtained are often different from scientific agreement [17], [18]. The information obtained from the references tends to be uniform. Students' conceptions need further testing whether the student understands the arguments presented well or memorizes the concepts from existing sources. Schematic description can see in Figure 3.

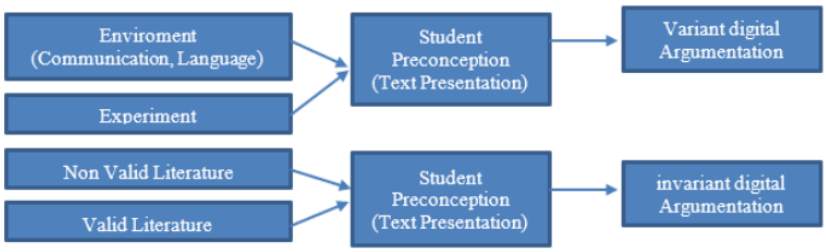

Figure 3. Schematically describes students' preconceptions obtained from the environment, experiences, and literature

The information obtained from the literature produces digital arguments that are uniform in nature [19], [20]. In Figure 2, students express their argument according to the textual knowledge obtained from learning sources. In Figure 1, students' preconceptions come from experience and the environment; the arguments are given variants and presented with communication [14], [21]. Delivering information with communication language provides information to the teacher that these students can communicate their knowledge well. They understand the information that is certainly better than textual knowledge, although the truth that conveyed still requires further testing. In Figure 2, the accuracy of arguing depends on the reference source read and the level of understanding. Correct conception is more dominant obtained from valid literature. The preconceptions obtained are often different from scientific agreement [17], therefore it is necessary to add learning activities in the form of making a summary of the material to be studied.

3.2. Phase II. Problems presented by students and peer problem responses

In stage II, students will analyze how they present problems and respond to their friends' problems. In the discussion forum, students asked to raise problems or respond to their group colleagues' problems. Descriptions of student problems and responses to problems presented in virtual arguments presented in Figure 4.

Figure 4. Response to peer problems by students A and B

In Figure 4, student A has not systematically explained the workings of animal and plant cells. The linkup space and questions submitted by colleagues have not been described in the questions. Student B can explain in detail the differences between plant and animal cells and explain their similarities.

Provide a statement that what is expected, as stated in the "Introduction" chapter can ultimately result in "Results and Discussion" chapter, so there is compatibility. Moreover, it can also be added the prospect of the development of research results and application prospects of further studies into the next (based on result and discussion). Figure 5a shows that student C still has problems distinguishing the concepts of Velocity and speed; student D still has difficulties distinguishing between instantaneous and average velocity. The issue of the concepts of velocity and displacement has been widely discussed [22], [23], one of the main factors is that in the previous levels of learning, information was received that the two concepts tend to be equated. If it is related to stage I, student D has understood well the concept of vectors in physical quantities, while student C still has problems in understanding these problems.

The questions asked by student C also provided information that he wanted to gain more in-depth knowledge regarding the difference in speed (scalar) and velocity (vector). Student D found it difficult to distinguish the concepts of mean and instantaneous velocity. In Figure 5b, student C gives a response related to the difference in the concept of instantaneous and average velocity. From the responses given by student C, it can see that the student strengthens the conclusion that student C does not yet understand the concept of vectors in physical quantities. Student D can explain the concept of speed and speed well to the questions given by student C. The problem of instantaneous and average velocity is caused by the definition of

everyday language usage which is different from the physics concept in textbooks [24]. Lecturers must be able to provide mathematical language strengthening to students.

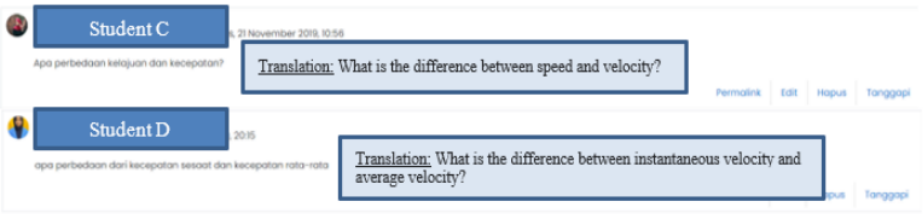

Figure 5a. Responses delivered by students C and D in the discussion

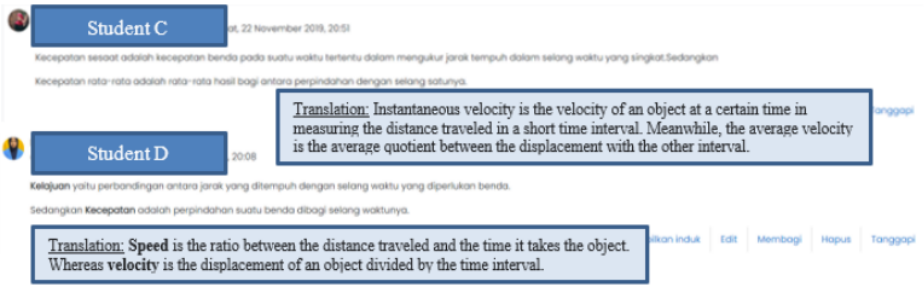

Figure 5b. Responses delivered by students C and D in the discussion

3.2.1. Discussion of description II

Based on the description of stage II data, the way students ask questions and express opinions can show their conceptions. The conception obtained from the stage 2 discussion strengthens the results of the stage I discussion. Incorrect conceptions caused by understanding some of the concepts cause students to experience difficulty understanding the next material. The student conception scheme can see in Figure 6.

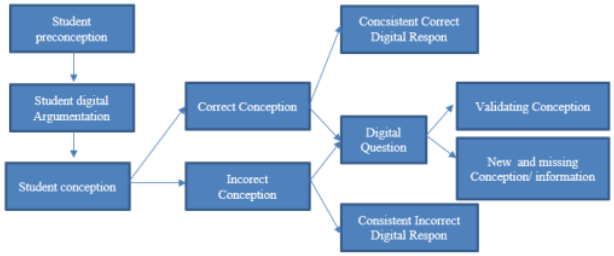

Figure 6. Student's Conception Schema

Based on the schematic in Figure 6, it can be seen that students who have incorrect conceptions are consistently wrong in providing arguments, students who have correct conceptions provide arguments for correct conceptions. In giving questions, students who have an incorrect or correct conception ask questions about the lack of understanding. Students who have incorrect conceptions try to test their conceptions by asking questions. Questions can arise because these students get information from the discussion processes

[25]. Students who have the correct conception give questions about new information obtained and information they did not previously understand. The discussion process can assist lecturers in profiling and making student conception schemes. The discussion process can also help students test their conceptions.

4. CONCLUSION

Based on the discussion of stages I and II, stage I obtained that digital arguments can reveal the student's conception through the discussion process. The sources of conception can identify based on the arguments given. Based on scheme 1, it can see that the source of students' conceptions is obtaining from the environment, communication processes, and learning resources. The sources of conception obtained from the environment and communication processes tend to be variants, while the literature sources tend to be invariant. Sources of conception obtained from various sources can be tested through instructions to make questions and provide discussion responses to colleagues' questions. The correct conception is consistent from stage I to stage II, and vice versa. The questions that are asked in the discussion process lead to testing the conceptions owned and strengthening new information.

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