HOW TO OVERCOME TRANSACTIONAL DISTANCE EFFECT ON ONLINE LEARNING DURING COVID-19 PANDEMIC

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Abstract

This study examines transactional distance in online learning during the covid-19 pandemic. Aspects related to student learning independence, lecture design structure, especially dialogue/interaction between students and lecture content, students and equipment, students and lecturers, and between students are the main focus of studies that can provide alternative actions to overcome the effects of transactional distance. A survey involving 35 students majoring in mathematics education, FKIP, Sultan Ageng Tirtayasa University, contracted the Research Methodology course. More specific information regarding transactional distance was then obtained through semi-structured interviews supported by a digital track record during lectures through the online learning system (SPADA). A qualitative approach with the case study method was chosen to describe the transactional distance explicitly. The results showed that students experienced transactional distance during online lectures with 76.57% learner-content interaction, 77.14% leaner-device, 76.00% leaner-lecturer, and 80.57% learner-leaner. The difference in the level of interaction between these aspects shows differences in students' level of satisfaction and comfort, which is the basis for determining how to overcome the effects of transactional distance.

Keywords: *online learning, pandemic Covid-19, transactional distance*

1. INTRODUCTION

The Covid-19 pandemic has changed the pattern of education and interactions between teachers and students (Pokhrel & Chhetri, 2021). These changes occur spontaneously when education actors adapt to technological developments 4.0. Behind it, technology is the only way to keep education going (Sharma, 2019). This situation encourages the change of new modes, from classic to digital, from face-to-face learning to online learning (Sukirwan, 2020).

Since the pandemic's beginning, some problems in online learning have often occurred and are inherent in every learning activity. They start from device problems signals to learning modes that are seen as causing problematic situations at the level of understanding of students and interactions between students and teachers. Many students feel that they have experienced Loss learning and hope that the pandemic will end soon and return to school.

The condition of loss of learning due to the COVID-19 pandemic occurs at the elementary and secondary education levels and in universities. College students must adapt quickly to digital devices, meet virtually, submit assignments online, and do activities mostly done independently. Although the problem of adapting technology in higher education is not as complicated as at the elementary, secondary, and general education levels, problematic situations still occur and are inherent in daily activities. Students feel a change in the lecture situation, which is felt to be a heavy burden, such as lecture assignments that accumulate, lecturer directions are not very clear, more time in front of the computer, independent lecture activities, lectures that are not

focused because of multitasking, and so on. In addition, network constraints are also a problem because of different geographical locations and cause communication to be not optimal.

Some problems, both related to the device and the interaction of lectures, are seen as the cause of the decline in the achievement of student learning outcomes. In the Research Methodology lecture at the Mathematics Education Department, FKIP, Sultan Ageng Tirtayasa University, in the 2021-2022 Academic Year, the average score obtained by students was 67.95. Whereas in the previous academic year, the average score obtained by students in this course was 88.41. 11 students, or around 12.64 %, had to take the assessment improvement because they got scores below the graduation threshold.

From the results of tracing the lecture track record, data on student compliance in completing assignments is 97.52%, student seriousness in completing assignments is 65.01%, student seriousness in participating in video conferences is 62.33%, and student activity in face to face. Virtual face by 22.17%. Some of the obstacles experienced by students were also reported that students experienced many problems in signaling because of the geographical location of the student's residence, which almost all telecommunication service providers did not support. In addition, the accumulated task load, limited access to discussions with classmates, understanding of course content delivered by lecturers in virtual rooms.
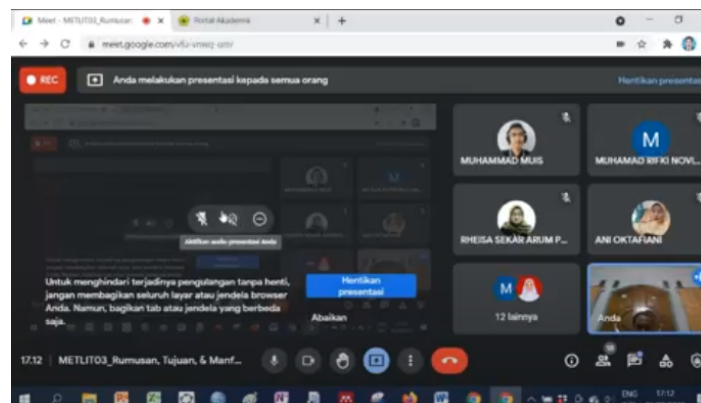
Figure 1. Off-Camera Students Due to Network Constraints

Untirta has basically implemented an integrated lecture mechanism and system through an online learning system known as SPADA to overcome this problem. SPADA is a Moodle-based online learning service that provides various learning management system (LMS) features. To develop the LMS, all lecturers are given the authority to design a lecture system where virtual face-to-face activities, discussions, assignments, practices, quizzes, and lecture evaluations are integrated into SPADA. LMS was developed using the I-CARE model in the Research Methodology course, namely: Introduction, Connection, Application, Reflection, and Extension. Through this model, it is hoped that students will not only attend lectures in virtual meetings, but can follow the stages of lectures comprehensively, starting from the initial study (Introduction), virtual face-to-face (Connection), group discussion (application), lecture review (reflection), and independent assignments and evaluations (Extention). In addition, students can also interact asynchronously with lecturers and other students through discussion forums and chats available in the LMS.

Figure 2. I-CARE Model Developed in Research Methodology Lecture

Several studies reported that the use of LMS and the integrated I-Care model in the online learning system (SPADA) increased the achievement of better learning outcomes (Bradley, 2021; Lin et al., 2017; Pratiwi et al., 2020; Siahaan et al., 2020). The I-Care model also triggers collaborative activities, communication skills, and creative thinking (Pratiwi et al., 2020; Siahaan et al., 2020). However, this achievement is strongly influenced by the interactions between students, students and teachers, students with content, and students with online devices used (Ahmad et al., 2017; Elyakim et al., 2019; Saadatmand et al., 2017). The intensity of this interaction affects the size of the transactional distance psychological gap (distance and time) that affects communication and interaction in online learning (Best & Conceicao, 2017; Ekwunife-Orakwue & Teng, 2014). Moore (1997) revealed that this transactional distance must be minimized to increase understanding, learning outcomes, and student satisfaction.

The study of transactional distance is so phenomenal that researchers compete to present empirical validity to the theory (Best & Conceicao, 2017). Even if it fails to provide consistent support, the theory of transactional distance is seen as essential and still helpful in creating a framework for analyzing online learning (Kassandrinou et al., 2014). This perspective then opens up space for research development based on transactional distance, especially on student acceptance of an instructional design. Although the context is subjective, input from students can be one of the benchmarks for developing better instructional designs.

2. LITERATURE REVIEW

1.1 Online Learning

Belawati (2019) explained that online learning is a teaching and learning process carried out within and with the help of the internet network. This term is widely affiliated with similar terms, such as distance learning, open learning, e-learning, computer-based learning. Although they are interrelated, the context of each of these terms is different. Distance learning is a learning system in which the existence of teachers and students are separated both in space and time, while e-learning is distance learning that utilizes technology/computer networks and or the internet (Moore et al., 2011). Online learning can also be in open learning, although not all open learning is online learning.

Online learning, in principle, is the connotation of offline learning. The term offline learning in Indonesia is better known as face-to-face learning, a dichotomy of fully online learning. Face-to-face learning is learning where students and teachers meet at one time. Along with the times, the dichotomy between the two forms of learning no longer occurs after the term blended learning is known (Belawati, 2019). Blended learning emphasizes the flexibility aspects of time, place, and situational barriers (Jeffrey et al., 2014). Blended learning combines face-to-face learning with online learning (Singh et al., 2021). How big an online mode plays a role in blended learning determines the different learning modes between hybrid learning, if the online mode is more dominant than the offline mode, and technology-enhanced classroom, if the online

capital used is less than the offline mode (Belawati, 2019). A flipped classroom is also where learning is carried out in class, while teaching materials and assignments are delivered online (Uzunboylu & Karagozlu, 2015).

Regardless of which online learning model is chosen, the most critical is implementing online learning to achieve optimal learning goals. In a more general sense, learning is an interaction between teachers, students and the learning environment where the interaction further impacts students' comfort in participating in learning (Ahmad et al., 2017). In online learning, the learning environment in question is a technological medium where students interact with technological devices and their content. This expression also implies that online learning is not enough to convey material in technological devices, but it must ensure that interactions occur between students, teachers, and students.

Dunhill (Belawati, 2019) explains the six basic principles of online learning; (1) contact between students and teachers, and facilities are available that allow the creation of interaction between students and teachers freely, (2) collaboration and cooperation between students, students are given space to discuss and share roles in learning, (3) active learning atmosphere, students are facilitated to be active in learning with a variety of choices and roles in learning, (4) fast feedback, teachers provide feedback to find out whether students have achieved the learning objectives set, (5) incoming learning objectives reasonable and achievable, learning objectives can be adequately formulated so that they are by the characteristics of students, and (6) appreciation for the differences that exist among students, giving equal treatment to students regardless of status differences. These six basic principles can be a reference for teachers to design online learning that can facilitate students to learn optimally. With this basic principle, teachers cannot immediately use online tools spontaneously but require a systematic and structured design through a learning management system.

In practice, although the learning management system in online learning has been designed in such a way, the separation of space and time can cause miscommunication. This miscommunication can occur in various ways, both in the relationship between students, teachers, and the device and material content. Moore (1997) calls it the term transactional distance.
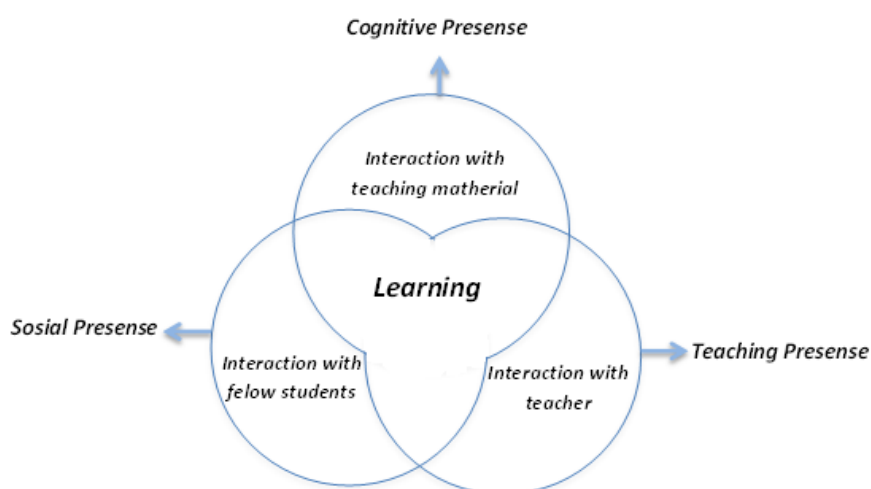
2.2 *Transactional Distance*

Moore (1997) reveals transactional distance theory as a psychological and communication distance that may arise in an instructional context and need to be minimized to improve student understanding, outcomes, and satisfaction. The term distance is more psychologically oriented than geographical because the level of interaction between teachers, students, and the environment determines the perceived distance. This theory applies to distance learning, although it also applies fundamentally to the concept of education in general, where the pattern of relationships between teachers, students, and the learning environment occurs.

Three main components affect the size of the transactional distance: the dialogue between the teacher and students, the structure of the learning design, and the autonomy or level of learning independence of students (Moore, 1997). Dialogue is a determining factor in the transactional distance because it affects changes in the other two components, where the level of dialogue facilitation can determine the level of the design structure and the independence of students' learning. However, changes in transactional distance are very dependent on changes in the three components. For example, transactional distance can increase when more structure, less dialogue, and greater learner independence (Ekwunife-Orakwue & Teng, 2014).

From an online perspective, the notion of dialogue has a broader dimension. Moore (1997)revealed that dialogue is a positive interaction between students and teachers. Interaction between students is an exchange of ideas, knowledge, and mutual feedback. This interaction allows students to understand better remembering in a peer and more open condition. The interaction between students and teachers allows a dialogue that provides feedback and motivates students to learn. This interaction complements the interaction that occurs between students where students still need the direction and guidance of the teacher to find out: (a) whether the students have understood correctly; (b) how learners should learn certain content.

In addition to interactions between students and between teachers and students, there is also an element of interaction between students and technology (Kassandrinou et al., 2014). Although not explicitly described by Moore, the interaction between students and technology in online learning is undeniable. In this case, online tools are communication media used in dialogue. Today, the interaction between students and technology is understood as digital literacy, where the ability of students to access technology greatly influences the level of students' understanding of learning. Bouhnik & Marcus (Belawati, 2019) implies that technical difficulties in mastering technology can affect the comfort and satisfaction of the learning experience so that it has an impact on students' perceptions of the system used.

Based on an understanding of the concept of dialogue, the interaction between components in the transactional distance is significant. Belawati (2019) tries to link learning interactions Moore (1997) with the community of inquiry theory (Saadatmand et al., 2017). The relationship is described Belawati (2019) like Figure 3 below.

Figure 3. Learning Interaction in Relationship between Transactional Distance and Community of Inquiry Theory (Belawati, 2019)

As in transactional distance theory, there are three main components in Community of Inquiry Theory: cognitive presence, social presence, and teaching presence. The presence by Saadatmand et al. (2017) is interpreted as a feeling of student involvement in learning, while learning is interpreted as an inquiry process that demands students' activeness in interacting with teachers, materials, and between students. Teaching presence is the experience of students in learning by the learning design. Meanwhile, social presence is an experience of interaction between students that provides a sense of togetherness in a learning entity to avoid feeling isolated. Cognitive presence is a crucial learning experience in which students interpret the whole interaction process and relate theory to the practice of everyday life. Thus, the concept of Community of Inquiry can offer a transactional distance problem where the interaction between teaching, cognitive, and social presence.

3.   RESEARCH METHODS/METHODOLOGY

Like the consensus of researchers, so far, transactional distance is measured based on the subjective perception of students (Best & Conceicao, 2017; Elyakim et al., 2019). Students experience the transactional distance themselves and understand what is needed. Therefore, an accurate description of the existence of transactional distance experienced by students is fundamental to obtain conformity that what is needed is an action to overcome the effects of transactional distance. For this reason, a qualitative descriptive method was established to determine the existence of transactional distance experienced by students during lectures and what students need to overcome the effects of transactional distance.

This study involved students from the Department of Mathematics Education, Faculty of Teacher Training and Education, Sultan Ageng Tirtayasa University, who contracted the

Mathematics Education Research Methodology course in the fifth semester of the 2020-2021 academic year. To explore transactional distance, as many as 35 students took online lectures for one semester using the Untirta Online Learning System (SPADA). At the end of the lecture, students then receive a transactional distance questionnaire that assesses the quality of interactions in online learning, both interactions between lecturers and students, interactions between students and students, interactions between students and content, and interactions between students and the devices used. Three students were then selected as theoretical samples to get confirmation and further information about the transactional distance experienced by students, including what students need. In addition, documentation in the form of lecture track records is also used to complete the data from questionnaires and interviews.

Data analysis was carried out through 3 stages: data reduction, data presentation, and data interpretation (Mezmir, 2020). In the data reduction stage, the results of the transactional distance questionnaire are tabulated, and then the percentage of student assessment results on the transactional distance for each aspect is calculated using the following formulation:

$$P = \frac{\sum A}{Nt} x100\%$$

where:
P : Percentage of student assessment on every aspect of transactional distance
$\sum A$: The number of each student's assessment of the transactional distance aspect
N : Number of students
t : The highest score of each questionnaire item

The data resulting from the reduction is then presented in the table of the results of the transactional distance questionnaire. The information in this table is compared with the results of interviews and supporting documentation to interpret transactional distance and how to overcome it. The interpretation of the transactional distance aspect is then given in Table 1.

Table 1. Interpretation of Transactional Distance

INTERACTION PERCENTAGE	TRANSACTIONAL DISTANCE PERCEPTION
P = 100	No transactional distance
66 < P < 100	Low transactional distance
33 < P ≤ 66	Average transactional distance
1 ≤ P ≤ 33	High transactional distance

4. RESULTS AND DISCUSSION

The results showed that the interactions during online lectures during the Covid-19 period were quite varied. Even so, the difference in the quality of interaction between learner-content, leaner-device, leaner-lecturer, leaner-lecturer, to leaner-leaner is not much different. Complete data can be seen in Table 2.

Table 2. Transactional Distance in Research Methodology Lectures

INTERACTION	N	QUALITY (%)
Learner-Content	134	76.57
Leaner-Device	135	77.14
Leaner-lecturer	133	76.00
Leaner-Leaner	141	80.57

Table 2 shows the transactional distance experienced by students in online lectures on research methodology during the Covid-19 period. Based on the interactions, the highest transactional distance perceived by students is the leaner-lecturer interaction and the lowest in the leaner-leaner. However, this condition is not too different compared to the leaner-content

and leaner-device interactions. If the average transactional distance is calculated from all interactions, it is still in the low transactional distance category (Huang et al., 2015).

In the learner-content aspect, material content is presented at SPADA in a learning management system (LMS). The lecture model used in this LMS is the I-CARE model, namely: Introduction, Connection, Application, Reflection, and Extension. The introduction phase is a pre-lecture phase that contains an initial study of the topics in virtual lecture activities. In this phase, students are asked to work on several pretest questions as a condition to take part in virtual lecture activities. So that students can work on these pretest questions, students must carry out independent activities by reviewing the material that will be delivered in lectures. Students attend virtual meetings synchronously according to a predetermined schedule in the connection phase. The lecture method is lecture and question and answers using ppt. In several meetings, presentations, practicals, and virtual discussions were held. To complete the lecture, ppt material is presented in the LMS equipped with files, videos, and reference books. Students are then given the task of discussing in the application phase. In this phase, students are facilitated using discussion forums to create discussion groups, discuss between groups, and discuss with lecturers. In the reflection phase, students are given reinforcement about the material that has been delivered. Reinforcement is given in quizzes, self-reflection, and material directions that have not been mastered. The last phase is the extension. In this phase, students are given independent tasks in development activities.
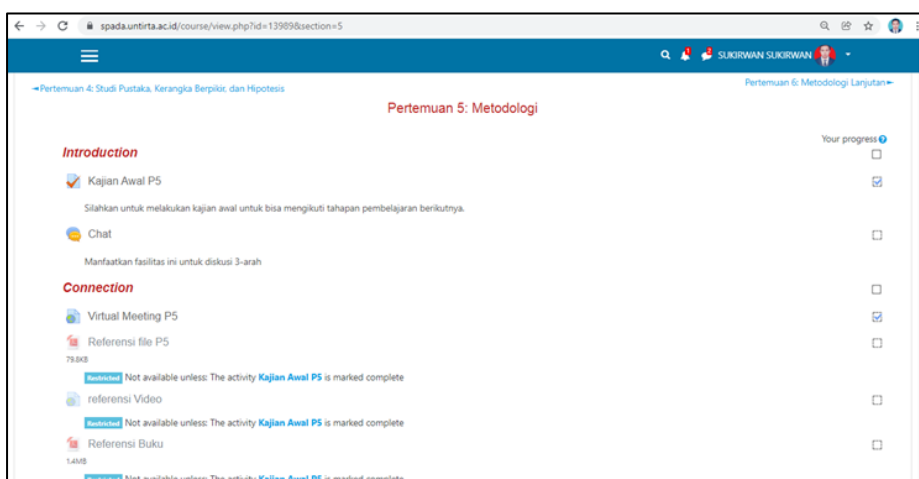

Figure 4. LMS Design for Research Methodology lecture

Based on the search for transactional distance, students view that the content is still less varied and minimalistic, the assignments are too many and complicated, the examples in the questions are not given, and the task time is relatively short. Compared to the LMS contents in Figure 4, the required contents have been added to the LMS. Some students view that the content presented does not support the assignments given. This is illustrated by the results of interviews conducted with the following students.

....
Lecturer   : "Haven't there been additional files, videos, and reference books?"
Student 1   : "Right, sir. However, the files do not support the task that you have given?"
Lecturer   : "What do you need?"
Student 1   : "We need files relevant to the assignment, as well as other additional material."
Lecturer   : "What about assignments?"
Student 1   : "Mostly, sir...."
....

The interview excerpts show that the content presentation still does not meet student expectations. The tasks given are still a burden for students, causing transactional distance. To overcome this, students need content that supports the completion of assignments. In addition, reducing assignments according to the portion of time owned by students can reduce the

transactional distance to complete them entirely and on time.

In the learner-device aspect, using SPADA based on the Moodle application is a policy set by the campus. In this aspect, it seems that students do not experience many obstacles, especially with SPADA devices. However, because the SPADA system often experiences "error" disturbances, students feel a transactional distance. As a result of these disturbances, students often experience delays in collecting assignments and disturbances when students take mid-semester exams and end-semester exams. The following interview excerpt illustrates that transactional distance is experienced by students when using SPADA devices.

....

Student 2	: "There is no problem using SPADA, and I already knew it when I learned Moodle."
Lecturer	: "Is SPADA well accessible at your place?"
Student 2	: "Well, that is a problem, sir. The signal is not very good where I live, so I have to adjust the place when I want to access SPADA. In addition, SPADA often has errors so that I sometimes lag to complete tasks."
Lecturer	: "How often do you get SPADA in an error condition?"
Student 2	: "Very often, some of my assignments do not work because of the deadline. The time for doing UAS was also late because when I wanted to upload it, SPADA happened to have an error."

....

The interview snippet above shows that although students' understanding of devices is not a problem, transactional distance occurs because of device errors. In addition, signal constraints also turned out to cause problems that resulted in students not being able to follow lectures optimally.

Students can interact with lecturers through synchronous and asynchronous activities in the learner-lecture aspect. In synchronous activities, students interact with lecturers during virtual meetings. A snippet of the activity during the virtual meeting can be seen in Figure 5.
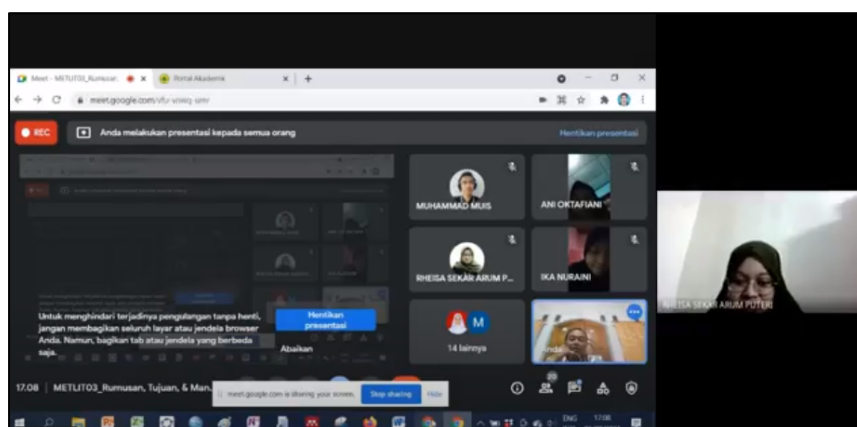

Figure 5. Virtual Meeting Snippets

In Figure 5, students generally interact with lecturers virtually using mobile devices. Some students are seen not presenting videos because of signal problems. Some of them also attend lectures while doing other tasks.

Students can also take advantage of discussion forums and chat facilities to interact with lecturers in asynchronous activities. This discussion forum is a feature provided in SPADA to facilitate students in completing group assignments, starting from downloading assignments, discussing in groups, discussing openly, asking lecturers, making independent virtual meetings to uploading assignments. The documentation of discussion forum facilitation can be seen in Figure 6.
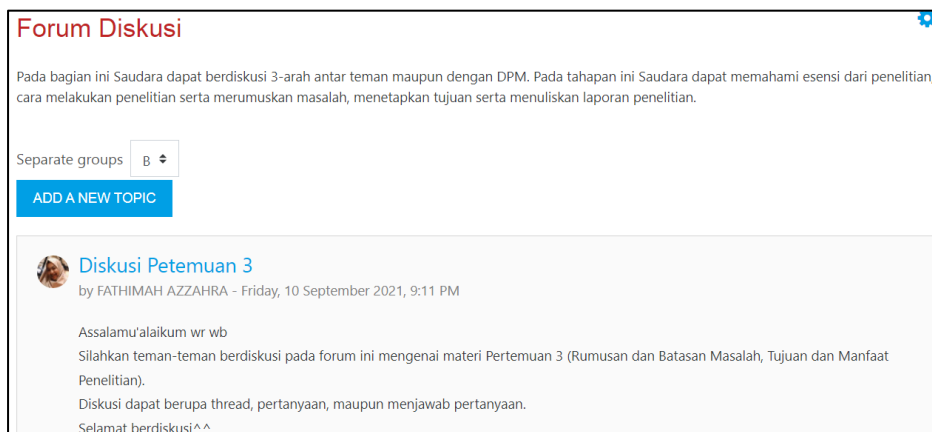
Figure 6. Display of the Discussion Forum in SPADA

In Figure 6, it can be seen that students have not used the discussion forum optimally. Students generally only submit statements to prove that they have filled out this section and get a checkmark (V) on the SPADA wastage statement. This sign is needed to continue learning to the next stage.

In addition to the discussion forum facility, students can also take advantage of the chat facility to interact with lecturers. One proof of chat facilitation documentation can be seen in Figure 7.
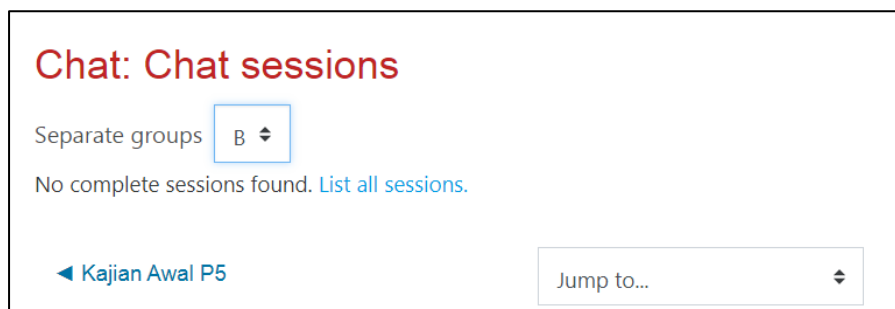

Figure 7. Display of Chat Facilities in SPADA

As with discussion forums, students also have not taken advantage of the chat facility optimally. Some students just opened the chat without writing anything down from the search results on digital records in the chat menu.

Based on the search for transactional distance on the learner-lecture aspect, students stated that the facilitation carried out by lecturers was still lacking and needed to be optimized. Students also think that they need the presence of lecturers in discussion forums, require a more detailed explanation of the material, clarity of information in assignments, and need additional time apart from meeting in virtual meetings. Compared with the communication facilities available at SPADA, such as discussion forums and chat, students do not seem to be very comfortable with communication through writing. In this case, transactional distance occurs because communication is not optimal, so students cannot communicate the difficulties experienced to lecturers.

Students feel more comfortable communicating directly with lecturers. The following interview excerpt illustrates that students can get more optimal guidance and are easily understood by them by communicating directly.

....
Lecturer   : "I saw the chat facility and discussion forums are not used much, just want a checklist."
Student 3   : "To be honest… like that, sir."
Lecturer   : "What do you want?"

Student 3 : "We are more comfortable being explained in person, sir. It is more understandable, and if it is difficult, you can directly ask it."
....

The interview snippet illustrates that students need facilitation from lecturers in direct communication. Students are also very enthusiastic when lecturers can provide direct guidance so that any difficulties experienced by them can be resolved entirely. Based on this information, transactional distance in the leaner-lecturer aspect can be handled through direct communication and assistance, both in learning and discussion forums.

In the learner-learner aspect, students experience relatively low transactional distance compared to other aspects. In this aspect, students can interact with other students through discussion forums and group assignments. Based on digital track records, student activities in discussion forums did not contribute much to learner-learner communication, but group assignments allowed students to communicate intensively and discuss the tasks that must be completed together. This can be seen from the following excerpts of interviews conducted between lecturers and students.

....
Lecturer : "Do you like doing group work together?"
Student 4 : "Right, sir. We discussed the task given by Mr.
Lecturer : "How do you feel about group assignments compared to individual assignments?"
Student 4 : "We are more comfortable with group assignments, sir. Because with group assignments, we can discuss and share tasks. We can also work things out."
....

Interview excerpts illustrate that students can interact well when working on group assignments. Based on digital track records, students are also generally able to complete all assignments in groups compared to individual assignments. This condition seems relevant to the transactional distance that occurs in the learner-learner aspect with a lower transactional distance effect than other aspects.

From the full description that has been described, both in the learner-content, learner-device, leaner-lecturer, and learner-learner aspects, it can be seen that transactional distance in learning will always occur. This is because the transactional distance is closely related to student satisfaction with learning. As reported in study b, students experience transactional distance in the relationship between the teacher and the learner and dissatisfaction in the online program component, but satisfaction and a sense of community arise for the direct program elements. Behind that, the method used to overcome the transactional distance effect is subjective in line with the perception of students feeling comfort in the desired aspect. Transactional distance is still considered essential to create a pedagogical framework for facilitating online learning in a more optimal direction.

CONCLUSION

Based on the results and discussion, it can be concluded that (1) students experience transactional distance in aspects of learner-content, learner-device, learner-lecture, and learner-learner, (2) overcoming the transactional distance effect is subjective depending on the level of satisfaction and comfort of students in learning. Learning. Students need content that supports assignments and a proportional task load in the learner-content aspect. In the learner-device aspect, action is needed to reduce error disturbances and anticipate so that disturbances do not occur continuously. In the learner-lecture aspect, lecturers need to facilitate students in direct communication, including being involved in task assistance and discussion forums. In the leaner-leaner aspect,

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