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Enhancing Foreign Workers' Online Learning Interaction Strategy: An Action Research in Indonesia Open University Taiwan

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Abstract: Indonesian workers in Taiwan have been taking synchronous online courses to enhance their education for several years. Still, the most crucial part of a synchronous course, the interaction quality, in the past, in general, was highly disturbed by the workers' busy daily work and had room to improve. Therefore, improving online interaction quality is a critical issue in workers' online courses. This study assigns an asynchronous learning strategy to supplement synchronous learning to enhance student interaction. Ten Indonesian workers as part of the Translation V course students of Indonesia Open University in Taiwan were involved. Action research was conducted to explore the effects of the asynchronous enhanced synchronous learning strategy on the students' interactions and perceptions. All the interaction threads were analyzed and described by social networking analysis, content analysis, and students' perceptions from their reflections. The results reveal that the students' interaction increased in the synchronous learning with informal assignment instructions directed by the tutor in the action research cycle II as an action to increase interaction in cycle I, which tended to be independent learning instructions. The study suggests implementing blended learning in synchronous online tutoring programs and providing asynchronous learning strategies to enhance online students' interaction.

Keywords: Instructional learning activities, action research, students' interaction, online learning, distance education

Highlights

What is already known about this topic:

- The distance education method carried out by the Indonesian Open University for Indonesian residents working abroad, especially in Taiwan, has been running for several years.
- Distance education conducted by the Indonesian Open University uses online and a teaching system such as traditional face-to-face teaching.

What this paper contributes:

- This research provides input for educational actors, especially teachers, in improving their teaching techniques to improve student interaction during remote teaching.
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Implications for theory, practice and/or policy:

- Educational institutions know how to make online learning environments work with a teaching system that can be used as a fixed system.
- Educators have referenced implementing their teaching instructions to increase student interaction in online learning environments.

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Introduction

Indonesia Open University in Taiwan provides online learning opportunities for Indonesian foreign workers to obtain higher education services in Taiwan. Among the various learning activities served, synchronous learning, regarded as an effective way of learning developed by the Indonesia Open University, is the most applied. Such online classes used to meet weekly via synchronous tools, such as Skype for Business, at night during or after work. However, due to the nature of the foreign workers, the synchronous learning is sometimes interrupted, which makes it more challenging to do their role as online learners. Most of these students work from Monday to Sunday, and most work as caregivers for elderly parents, who require standby assistance at all times. This situation presents challenges in preparing for their studies and also disrupts their time, as commonly experienced by other online learners (Riady, 2014; Kuo & Belland, 2016; Puspitasari & Oetoyo, 2018).

The students who attended the class used to take turns, and the tutor found it hard to identify how many students would attend from the beginning of the class to the end. Meanwhile, some students come late to class or are late submitting assignments. Such a condition becomes an obstacle for the tutors who have prepared the class activities for the learning day and leads to a lack of interaction during the learning and lecturing period. Therefore, for foreign workers, energizing the students to interact better online is challenging.

High interaction affects increasing students' and instructors' satisfaction with online distance learning (Bernard et al., 2009), and high-quality interaction, in general, is regarded as a practical online tutorial. For example, Sembiring (2018) explored the determinant of students' satisfaction in the online tutorial at Indonesia Open University and found that the most critical factor in a practical online tutorial is the tutor's strategy to manage instructional activities in each session of class. In addition, Sembiring (2018) found that online tutors' readiness to teach is one of the determining factors for the success of online learning. By infusing technology affordances, the tutors can develop online strategies to manage instructional activities and increase their lecturing readiness (Bernard et al., 2009).

One of the approaches to enhancing the synchronous online tutorial activities in class is to adopt asynchronous learning activities before the class as a kind of blended learning strategy. More specifically, it is worth exploring the effect of adding a well-designed asynchronous instructional strategy to enhance the synchronous interaction at Indonesia Open University. Therefore, this study aims to design asynchronous instructional methods as a way to enhance the existing synchronous learning interactions at Universitas Terbuka Indonesia in Taiwan. In order to achieve this objective, the study employed action research and was guided by two research questions:

- RQ 1: How were interactions occurring when asynchronous instructional activities were applied in the online learning environment?
- RQ 2: What were students' perceptions of asynchronous instructional activities in the online learning environment?

Literature

Interaction in Online Learning Education

Interaction plays a crucial role in distance education and online learning, and several studies have explored the types and levels of interaction in online education models. Moore (1989) identified three types of interaction in distance education: student-content interaction, student-student interaction, and student-teacher interaction. Bernard et al. (2009) conducted a meta-analysis study and found that all three types of interaction treatments, including learner-content, learner-instructor, and learner-learner, had a positive effect on learning outcomes. Coates (2007) developed a model of online and general campus-based student engagement, highlighting the importance of active participation, a sense of belonging, and interaction with peers and instructors. Kahu (2013) identified meaningful academic

challenge, a sense of belonging, and student-teacher relationships as key elements of student engagement in higher education.

Abrami et al. (2011) proposed using evidence and theory to improve the practice of interaction in distance education and online learning. They emphasizes the importance of interaction in distance education and online learning. The found that all three types of interaction - learner-content, learner-instructor, and learner-learner - were positively associated with learning outcomes, with learner-learner interaction having the strongest effect. The article discusses theoretical perspectives on interaction, including social constructivism and transactional distance theory, which provide a framework for understanding the importance of interaction in promoting learning. The authors provide practical guidance for improving instructional practices, emphasizing the importance of designing learning activities that promote interaction, such as group projects and online discussions. They also discuss the use of technology to support interaction, such as video conferencing and online collaboration tools.

Meanwhile, Anderson (2003) stresses the importance of interaction in online and distance learning environments, emphasizing that effective learning environments require a mix of learner-content, learner-instructor, and learner-learner interaction. He provides a framework for designing such learning environments by reviewing various theoretical perspectives on interaction, including social constructivism, transactional distance theory, and communities of inquiry. Anderson also highlights the role of technology in supporting interaction and offers practical guidance for achieving better learning outcomes through interaction. The theoretical background provided by Abrami et al. (2011) and Anderson (2003) guides this study to enhance foreign workers' online learning interactions.

Instructional Activities in Online Learning

Instruction was defined as the purposeful direction of the learning process. Instructional activities are instructions for students to do activities designed or chosen by a tutor or teacher in online learning to produce classroom learning (Su et al., 2005; Smaldino et al., 2015). A tutor or a teacher needs to consider the students' individual differences and learning styles before designing the instructional activities (Joyce et al., 2003). Instructional activities in synchronous online learning can be in the form of explaining the material, giving direct instruction, and getting feedback from the teacher and students (Martin et al., 2012). The challenges in synchronous online learning include time zones, Internet access, learning device capabilities, or technology literacy. Instructional asynchronous activities can be done before or after class, such as in flipped classroom learning (Strayer, 2007). The benefit of doing asynchronous instructional activities is that students can ask or continue the discussion that is limited in class (Davidson et al., 2001). Several instructional activities of the asynchronous method are available, such as quizzes, questionnaires, learning reflections, discussion forums, etc. These instructional activities can be applied simultaneously by a tutor or teacher to increase interaction in the learning environment (Conrad & Donaldson, 2011).

Well-designed instructional activities help students learn online (Ausburn, 2004; Bozarth et al., 2004; Yang, 2017). It also supports students to feel secure and convenient in learning and will help them to increase their interaction in online learning (MacGregor & Lou, 2004; Lee et al., 2011; Yang, 2017). Baldwin (2017) states that the success of online learning depends on the ability of the tutor and students to work together in the teaching and learning process.

Instructional synchronous and asynchronous increase interaction in online learning

Online learning has become increasingly popular in recent years, and with it comes the need to explore different ways to increase student interaction and engagement. One way to achieve this is through the use of synchronous and asynchronous tools in online courses. Recent studies examine the impact of using these tools in online courses to promote student interaction and engagement.

One study conducted by Lowenthal, Dunlap, and Snelson (2017) found that synchronous web meetings were effective in improving instructor-student communication and increasing student interaction in asynchronous online courses. However, the authors cautioned that the use of synchronous instruction requires careful planning and consideration of technical issues and scheduling conflicts.

Another study by Moallem (2015) investigated the impact of synchronous and asynchronous tools on various aspects of online learning, including learner self-regulation, social presence, immediacy, intimacy, and satisfaction. The study found that the use of synchronous tools had a positive impact on student interaction and satisfaction. Additionally, synchronous tools can provide a sense of immediacy and social presence that is often lacking in asynchronous online courses.

Romero-Hall and Vicentini (2017) conducted a case study that examined the experiences of distance learners in hybrid synchronous instruction. The study found that synchronous instruction was effective in promoting student interaction but presented challenges such as technical issues and scheduling conflicts. The authors recommended that instructors provide clear expectations and guidelines for synchronous instruction to minimize these challenges.

Lee et al. (2015) investigated the use of time-anchored peer comments to enhance social interaction in online educational videos. The study found that the use of time-anchored comments had a positive impact on student interaction and engagement. The authors suggested that this approach could be used to increase student engagement in other types of asynchronous online courses.

Yamagata-Lynch (2014) explored the blending of online asynchronous and synchronous learning. The study found that the combination of synchronous and asynchronous instruction was effective in promoting student interaction and engagement. The author also noted that instructors play a critical role in facilitating interaction and engagement in blended learning environments.

Banna et al. (2015) investigated strategies to promote engaged learning in an online introductory nutrition course. The study found that the use of synchronous tools had a positive impact on student interaction and engagement. The authors suggested that instructors should use a variety of tools to promote student engagement in online courses.

Finally, Oztok et al. (2013) explored the use of both asynchronous and synchronous tools in online courses. The study found that the use of both types of tools had a positive impact on student interaction and engagement. The authors recommended that instructors provide clear expectations and guidelines for both types of tools to ensure that students understand their purpose and how to use them effectively.

In conclusion, previous studies provide evidence that the use of synchronous and asynchronous tools in online learning can increase student interaction and engagement. The studies also provide specific strategies and recommendations for instructors to promote student engagement in online courses. However, challenges such as technical issues and scheduling conflicts must be considered when using synchronous and asynchronous instructions. This study focuses on exploring the role of instructors in enhancing student interaction and engagement in online courses using both synchronous and asynchronous tools.

Methodology

Context and Participants

The study was conducted in a Translation V class at the Indonesia Open University in Taiwan, which was held for 11 synchronous online tutorials in one semester. The class was held once a week at 9 p.m. and lasted two hours. Ten full-time household helpers or elderly foreign nurses and foreign workers from

Indonesia in Taiwan were enrolled in the class as students, and all were female, aged between 27 to 40 years old. Facebook was selected as an asynchronous tool for the study since it is currently the most dominant social networking platform among students in higher education (Lampe et al., 2011; Dahlstrom, 2012).

Research Design

An action research approach was adopted. According to Mertler (2017), action research is a collaborative approach to inquiry that involves educators working together to identify and address educational challenges in their own classrooms or schools. It is characterized by a cyclical process of planning, acting, observing, and reflecting, with the ultimate goal of improving educational practices and outcomes. Action research is seen as a means of empowering educators, promoting professional learning, and improving education through the active participation of those involved in the educational process. The study aims to increase the students' online learning interaction and to explore the students' learning process and outcomes. Based on the action research guide, action research is a cyclical process used to address problems or answer questions about educational processes in a particular setting. Therefore, in this study, two cycles were employed, each with four steps: planning, acting, observing, evaluating, and reflecting.

Procedure

Cycle I was held at the 1st–sixth sessions and Cycle II was held at the 7th–11th sessions. In Cycle I, the tutor created a Facebook group as their learning platform to supplement the synchronous learning platform. After Cycle I was done, the data was evaluated and observed, and the results of this stage were then reflected to be used as a plan in Cycle II. Cycle II was also conducted as well as Cycle I. At the end of class, the tutor held a focus group discussion about their responses based on their experiences in Cycle I.
As shown in Fig 1, the action research procedure in this study can be described as follows:

Cycle I
The first author of this paper serves as the tutor in this study who had taught the students for several weeks and found that the interactions that occurred in the learning environment were lacking in the synchronous online tutorial and did not utilize asynchronous tools for learning media. Hence, the researcher conducted action research starting from cycle I with four stages.

Step 1: Planning
This stage begins with designing the actions to be conducted in the study, including:

- Create a Facebook group as an asynchronous tool in a learning environment
- Pre-class and post-class instructions for asynchronous learning activities are posted by the tutor every week

Step 2: Acting
The tutor instructs the students. In this stage, the instructions are given so that the students can learn independently. The pre-class instruction posted by the tutor is:

- Post the instruction three days before the class for pre-class asynchronous learning, and
- Feedback/Response given by the tutor and students in three days during the pre-class time

An example of independent learning instruction posted by the tutor was as follows:

"Hi, class! We have Facebook Group Translation 5. If you have any questions regarding the topic we are going to learn, or you want to pick a particular topic we need to discuss in the class, or you want to write your summary or idea before class, you are welcome to write and post those all to our Facebook Group. All posts open to comment and discuss!"

Meanwhile, the post-class instruction posted by the tutor is:

- Post the instruction after in-class time for three days of discussion, and
- Feedback/Response given by the tutor and students during three days post-class time

An example of independent learning instruction posted by the tutor was as follows:

"Hi, class! If you have any questions regarding the topic we have learned, you can post on this group. You can also write your reflection or summary of what you have got from the class, and all posts are open to comment and discuss!"

Step 3: Observing
Observations were made throughout the pre-class and post-class by paying attention to the interactions on the Facebook group. The posts were given by each participant, whether in the form of responses, questions, or proposals. All the posts were recorded and collected as the data in this study. The results of these observations were analyzed and evaluated at the next stage.

Step 4: Reflecting
The researcher observed and did a focus group with the students in Cycle I and found that students are unmotivated to do independent learning or preparation before class. Beyond the focus group discussion, the Cycle I observations was also discussed with external observers. The results from Cycle I revealed that only asynchronous activity could not fully support the synchronous learning activity.

Cycle II
In Cycle II, the tutor changed the pre-class and post-class activities as informal assignments for the students and let the students easy to understand and follow the instructions. The design goal of the instructions was to stimulate the students' initial contact with the learning content, peers, and tutor. Like Cycle I, there are four stages in Cycle II, and the details of Cycle II are elaborated as follows:

Step 1: Planning
This planning stage was carried out to prepare the instructional strategy to increase participants' interactions. The planning was the result of reflection obtained in Cycle I, and the planning was reorganized as follows:

- Pre-class and post-class posts should have more than two instructions consisting of the simple question, quizzes, games, multiple choices, etc.
- Post the title "Ticket to the class" as the pre-class informal assignment three days before in-class
- Post the title" Ticket out of the class" as the post-class informal assignment for three-days discussion activity before the next class.

Giving feedback and reminding the students to do "the ticket to the class" and the "ticket out of the class."

Step 2: Acting
The tutor gave "Ticket to the class" and "Ticket out of the class" as the pre-class and post-class activities, respectively. Instructional activities from the tutor can be seen as follows:

- Pre-Class Instruction
    - The students prepare three questions as "The ticket to the class." That means that the students must do or answer "The tickets" questions before class starts
    - Motivational quote written below the questions
    - The tutor reminds the students to do the "Ticket to the class" before the class
    - The time given to do this informal assessment and discussion is up to three days before the synchronous learning

Examples of informal assignment instruction posted by the tutor are as follows:

"Ticket to the class! Do at least one of these before entering the class with your ticket!" (tutor posts three points each week, and the informal assignment adjust to the Translation V course at Indonesia Open University Taiwan)

1. What is the English title of chapter 8? (Students need to translate it into English)
2. Please write the fifth line, paragraph four of Chapter 8, in English!
3. Fill one sentence in the blank and go from there...continue the last sentence your friend has already done!

"Alkisah, dalam satu tahun yang sama ada dua orang wanita yang sama-sama hamil,…" lanjutkan…

- Post-Class Instruction
  - The tutor provides post-class instruction as "Ticket out of the class" activities.
  - Feedback and discussion elaborated from tutor and peers
  - The tutor reminds the student to do the "Ticket out of the class" after class
  - The time given to do this informal assessment is up to three days after the synchronous virtual class took place

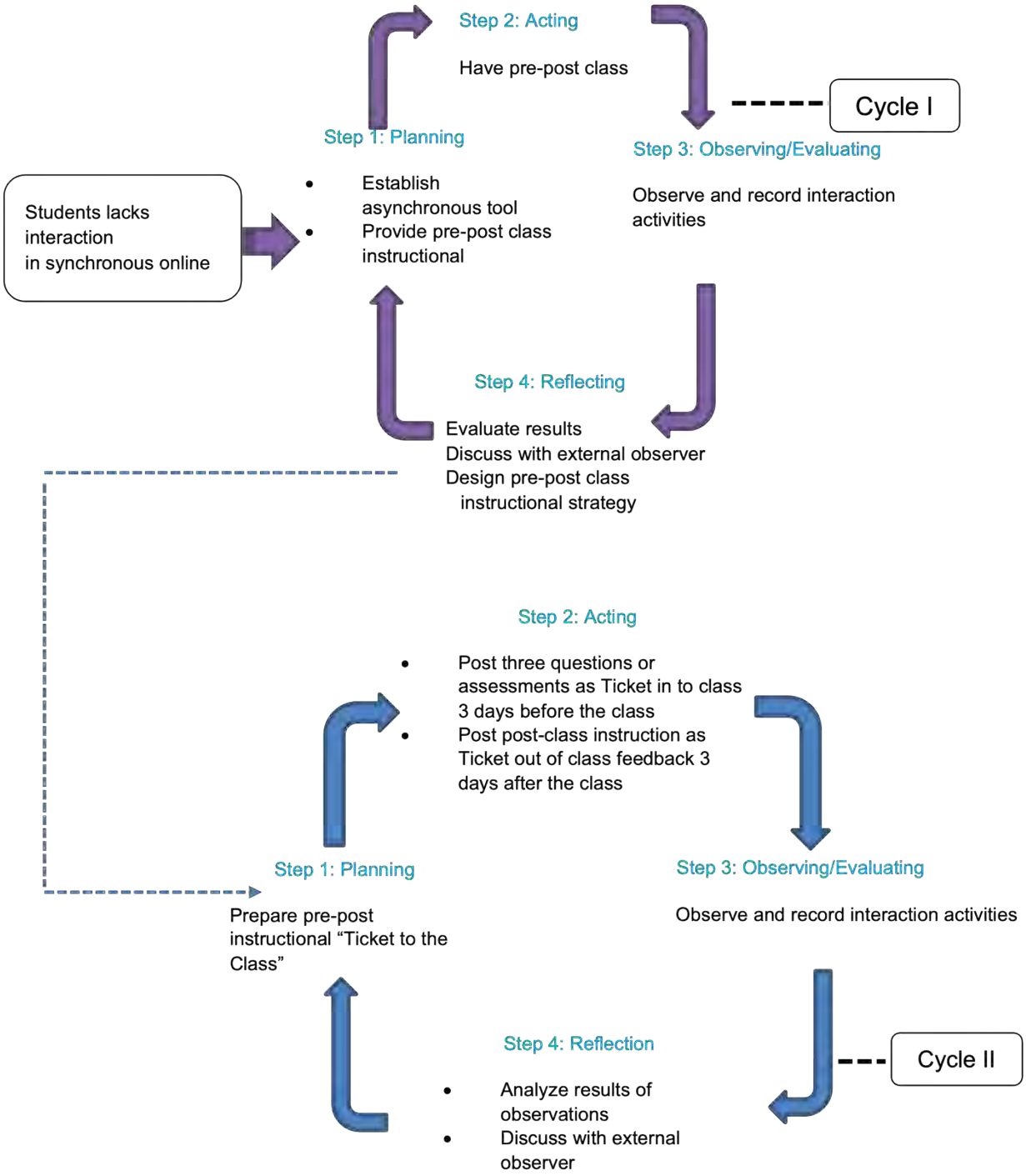
Examples of informal assignment instruction posted by the tutor:
"Hi class, thank you for coming to the class today, and I hope you like it! As we want to wrap our lesson today, you can do one or all of these instructions as your "Ticket out of the class"/ post-class activities"

1. You can continue our discussion to do exercise part three, numbers 4 and 5 and discuss the result together!
2. Do you still have gaps or questions regarding our class, welcome to post!
3. What have you learned from the lesson, and what do you want to know more about?

Step 3: Observing
Observations were made throughout the pre-class and post-class. Same as in Cycle I, observations were made by paying attention to posts given by each participant, whether in the form of responses, questions, or suggestions on the Facebook group. All posts were recorded and collected as the data source in this study. The results of these observations will be analyzed and evaluated at the next stage

Step 4: Reflecting
The authors analyzed the results of observations from Cycle II and then discussed them with the external observer. As a result of the second reflection, in Cycle II, informal assessments in pre-class and post-class show improvement in interaction. To meet the trustworthy results, the data were analyzed by social networking analysis, content analysis, and qualitative results from students' perceptions.

Figure 1. Action research with asynchronous activity facilitated



Data Analysis

Social Network Analysis and content analysis were conducted on the data gathered from the records of learning environments. Data and analysis with corresponding research questions (RQ) are included below:

Research Question 1 (RQ1)
Tutor and the students' social network analysis

To understand the extent to which the instructional activities had enhanced interaction, data from the Facebook group was collected, transformed, and calculated. For example, if student A replied to student B in the learning activities, we would record 1 in the cell of row student A and column B. Table 1 lists the ID participants and the adjacency matrix of interactions. The adjacency matrix is used in excel to transform the original relational data matrix of teacher and students' interaction. The matrix shows ID participants participating in courses, such as tutor, student A, …, and student J.

Table 1. Participants' ID and adjacency matrix of interaction

ID	Tutor		#A		#B		#C		#D		#E		#F		#G		#H		#I		#J	
Cycle	CI	CII	CI	CII	CI	CII	CI	CII	CI	CII	CI	CII	CI	CII	CI	CII	CI	CII	CI	CII	CI	CII
Tutor	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
#A	1	1	0	0	0	1	1	1	1	1	0	1	0	1	0	1	1	0	0	0	0	0
#B	1	1	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	0
#C	1	1	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	1
#D	1	1	1	1	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0	1	0	0
#E	1	1	0	1	0	0	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
#F	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
#G	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0
#H	1	1	0	1	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0
#I	1	1	0	1	0	0	0	1	0	0	0	1	0	1	0	1	0	0	0	0	0	1
#J	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1

Note: #A stands for Student A, #B stands for student B, and so on. CI stands for Cycle I, CII stands for Cycle II

Besides the matrix description, the interactive visualization describes whether there is a relationship among nodes in the discussion forum in the Facebook group. Meanwhile, the interactive visualization demonstrates whether the relationship is multi-valued or not and whether it has a direction. Nodes and lines represent participants' relationships, where nodes represent the relative objects and lines indicate the relationship between subjects. Social network analysis was conducted on participants' interactions in Cycle I and II. To measure the interactions, the density and centrality factors were applied, in which density represents the compactness of the interaction among participants, and centrality analysis is used to measure to what extent a participant's status, superiority, privilege, and reputation in the group. This study analyzed interaction with degree centrality, betweenness centrality, and eigenvector centrality, which aimed to explore the centrality of participants' interactive networks.

Content Analysis
The content data were analyzed using content analysis and choosing sentences as a single unit of meaning and would be validated by two coders to calculate the reliability of segmentation and coding categories. We adapted and developed the coding categories based on Soller's (2004) model, as shown in Table 2 since this model gives a wide scope of diagnostic measurements which can provide a response to our research purpose. Also, we changed Soller's model with the goal of ensuring that our information can be investigated most precisely. The sentences for which no category was reached as to the main category were coded as non-codable (NC).
In this study, a reliability test was conducted by two coders on the segmentation procedure using multiple reliability coefficients such as percent agreement, Cohen's Kappa (κ), and Krippendorff's alpha (α).

Table 3 shows the reliability values of coding categories in Cycle I and Cycle II. The reliability value of percent agreement is 0.961 in Cycle I and 0.948 in Cycle II. Cohen's Kappa (κ) is 0.753 and 0.757 for Cycle I and Cycle II, and Krippendorff's alpha (α) is 0.990 and 0.996 for Cycle I and Cycle II. These values concluded that coding categories could be acceptable for drawing conclusions.

Table 2. Coding categories of study

Category	Definition	Code
Creative Conflict		
Mediate	Suggested tutor intervene to answer a question	11
Discuss	Discuss and argue about comments or suggestions from other participants	12
Active Learning		
Request	Ask for advice/answer to solve the problem or in understanding peers comments	21
Inform	Involving in the conversation by providing information or ideas.	22
Motivate	Providing positive feedback and reinforcement	23
Conversation		
Task/Assign	Shift the current focus of the group to a new subtask or tool	31
Maintain	Support group cohesion and peer involvement	32
Acknowledge	Inform peers that you read and/or appreciate their comments.	33
Non Codable	All types of statements that not belong to any category specified	40

Source: Soller (2004): Supporting social interaction in an intelligent collaborative learning system. International Journal of Artificial Intelligence in Education, 12(1), 40-62

Table 3. Reliability of coding categories

	Cycle I	Cycle II
N Agreement	172	331
N Disagreement	7	18
Total Comments	179	349
Percent Agreement	0.961	0.948
Cohen's Kappa	0.753	0.757
Krippendorff's Alpha	0.990	0.996

Source: Authors' computation

Research Question 2 (RQ2)

The subsequent analysis of this study explores participants' perceptions of the use of asynchronous instructional activities in their interactions in an online learning environment. Content analysis was used to analyze the data to answer the second research question. Each participant's comments were grouped into three parts of interaction in online learning, as stated by Moore (1989). The three parts are student-student interaction, student-teacher interaction, and student-content interaction.

All of the video perception records and interview results from students were scrutinized. The data set was meticulously read to check whether student-student, student-teacher, and student-content interactions occurred throughout students' experiences during the learning process.

Findings

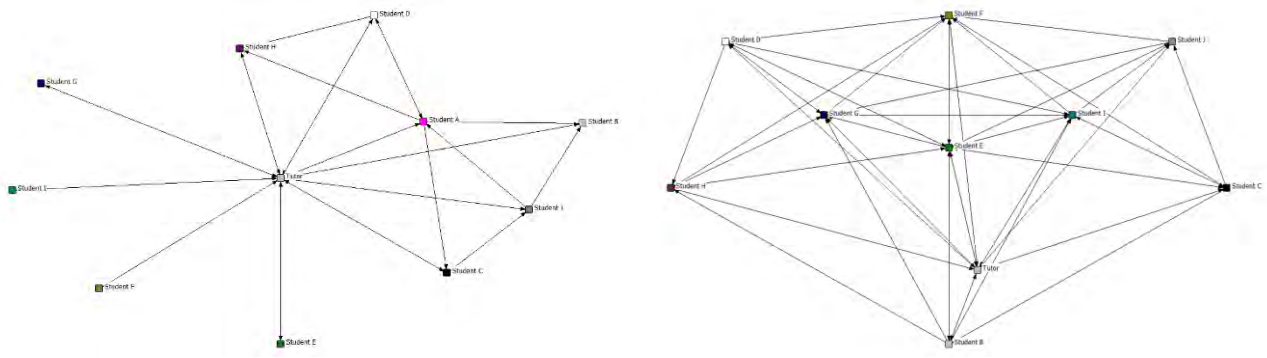
The two primary data sources in this study to analyze are the forum discussion and postings on the asynchronous platform and the video records of the students. The results of the analysis are shown as follows:

RQ 1. How were interactions occurring when asynchronous instructional activities were applied in the online learning environment?

The Visualization of Interaction

It was intended to describe students' social interactions in Cycle I and Cycle II. Visualizations of both cycles are presented in Figure 3, which shows the involvement of the participants. In Fig. 3, each participant is assigned a "node," and directed lines between the nodes represent the direction of interactions.

Figure 2. Visualization of Cycle I and Cycle II



Cycle I Cycle II

The Measurement of Interaction

In measuring the interactions among participants in Cycle I and Cycle II, the following factors can be found:

Table 4. Measurements of social network analysis

	Cycle I	**Cycle II**
Density	0.2479	0.6033
Degree Centrality	81 %	42%
Betweenness Centrality	83.89%	18.64%
Eigenvector Centrality	72.52 %	19.53 %

Source: Authors' computation

Density

Density represents the compactness of the interaction among the participants. The greater the network density is, the stronger the interaction occurs. As shown in Table 4, the density of interaction in Cycle I was 0.2479, which was lower than the value of the density of interaction in Cycle II, which was 0.6033. The increase in density value also shows that the closeness of the participants is also increasing. This shows that the level of students' participation increased in Cycle II when the tutor directed the informal assignment instructions to distance education.

Degree Centrality

Degrees of centrality measure the participants' connectivity. In Cycle I, the group's mean was 2.636, and the tutor was the highest, with a degree measure of 10, indicating that the tutor interacted with 10 participants. While student A interacted with 4 participants at most in the group (including tutors), other students interacted with fewer than 4 participants, indicating that the participation of the students in the class was meager. However, in Cycle II, the value of other students increased. For example, students G and F scored the lowest by interacting with only three people, while other participants scored above 3. The result demonstrated that the students could increase their interactions with each other in Cycle II through the application of informal assignment instructions.

Betweenness centrality

Betweenness centrality measures the extent to which one participant controls his/her relationship with others. The larger the betweenness centrality value, the more one participant controls others. In other words, the participant will play the role of a bridge for other members in the group and be the core of the learning activity. In Cycle I, the mean betweenness score for the group was 7.364. There is a reasonably significant difference between the tutor's "betweenness" score and the other participants' mean scores for the group, reinforcing the conclusion that this was a tutor-driven forum. Besides, regardless of the tutor's interaction, participants (with a few exceptions) tended not to form strong connections among themselves. This phenomenon suggested that only a few active students were in Cycle I.

In contrast, in Cycle II, the mean score was 3.818. Although the betweenness centrality's value of tutoring was still relatively high, the value of students' betweenness centrality was increased in Cycle II. The decrease in the betweenness centrality value of this tutor and the increase in the betweenness centrality value of students showed that all students in Cycle II were increasingly active in participating and did not center on someone who was the intermediary among other students. This finding indicates that implementing informal assignment instructions in Cycle II provides a stimulus for students to participate directly and connect directly with other students without having to be bridged by tutors or other students.

Eigenvector centrality

Eigenvector centrality is used to measure the influence of a participant in a network. It assigns relative scores to all participants in the network based on the concept that connects to high-scoring participants contribute more to the score of the participants in question than equal connections to low-scoring participants.

In Cycle I, the tutor still has the highest eigenvector centrality score, and the students have lower eigenvector centrality scores. This result showed that in Cycle I, the students had minimal interaction with other students. In Cycle II, even though the eigenvector centrality score of the tutor was still the highest one, however, the scores of the students were increasing. It describes that in Cycle II, the students played a role in interacting with other participants. It means that the students in Cycle II have the same influence, and none of them is more prominent because they have interacted better, and the interaction network formed in this learning environment is more robust than in Cycle I. Implementation of informal assignment instructional activities has created interactivity in the online learning environment.

Content Analysis

The result of content analysis for RQ1 given in Table 6 showed the relationship between the participants and each category. The tutor posted 179 comments in Cycle I and 331 in Cycle II, and ten students were analyzed. As shown in Table 6, it can be seen that the increase in comments from each student. Although tutors still have the most prominent discussion comments, the students experience an increase in discussion and have an active role in the learning process. This indicated that informal assignment instructional activities could help students to improve their interactions in this online learning environment. In particular, students D, student C, student A, and student B demonstrate the most comments in this learning forum.

Table 5. Centrality values of interaction

Participants	Degree Centrality				Betweenness Centrality		Eigenvector Centrality	
	Cycle I		Cycle II		Cycle I	Cycle II	Cycle I	Cycle II
	Outdeg	Indeg	Outdeg	Indeg				
Tutor	10	10	10	10	76.000	19.067	0.701	0.616
#A	4	4	7	9	3.500	7.917	0.190	0.293
#B	2	2	6	3	0.000	0.817	0.220	0.249
#C	2	2	7	4	0.500	1.200	0.233	0.246
#D	3	2	7	4	0.000	2.067	0.078	0.337
#E	1	1	9	7	1.000	5.233	0.192	0.232
#F	1	1	3	9	0.000	1.950	0.335	0.316
#G	1	1	3	8	0.000	1.250	0.413	0.315
#H	1	3	5	5	0.000	0.833	0.118	0.128
#I	1	1	7	5	0.000	1.500	0.072	0.149
#J	3	2	4	4	0.000	0.167	0.158	0.084
Mean	2.636	2.636	6.182	6.182	7.364	3.818	0.246	0.269
Network Centrality Index	81 %	81%	42 %	42%	83.89 %	18.64%	72.52%	19.53%

Source: Authors' computation

Table 6. Statistics of categories

Participants	Creative conflict				Active Learning						Conversation						NC		Total		Disagreement	
Cycle	CI		CII		CI			CII			CI			CII			CI	CII	CI	CII	CI	CII
Code	11	12	11	12	21	22	23	21	22	23	31	32	33	31	32	33	40	40				
Tutor	0	3	0	6	25	9	3	9	9	10	24	11	9	21	31	10	0	0	84	96	3	2
#A	0	1	1	8	0	8	0	3	11	2	0	2	0	1	3	5	0	0	11	34	0	1
#B	0	0	0	8	0	1	0	4	10	4	0	2	4	0	1	5	0	0	7	32	1	2
#C	1	1	0	7	0	11	0	6	14	2	1	0	4	0	1	5	0	0	18	35	1	2
#D	0	2	0	6	2	7	0	0	9	2	0	0	1	0	3	5	0	0	12	25	1	3
#E	0	1	0	8	2	11	0	8	18	2	0	0	0	0	0	4	0	0	14	40	0	2
#F	0	0	0	3	0	4	0	3	2	1	0	1	0	0	2	0	0	0	5	11	0	3
#G	0	1	1	3	0	7	0	4	8	1	0	0	1	0	2	3	0	0	9	22	0	3
#H	0	1	0	4	0	8	0	4	16	1	0	0	2	0	0	1	0	0	11	26	0	0
#I	0	0	1	4	1	2	0	2	6	0	0	0	0	0	0	3	0	0	3	16	1	0
#J	0	0	0	1	0	3	0	2	9	0	0	0	2	0	0	0	0	0	5	12	0	0
Total	1	10	3	58	30	71	3	45	112	25	25	16	23	22	43	41	0	0	179	349	7	18

Source: Authors' computation=
Note : The numbers of 11, 12, 21, 22, 23, 31, 32, 33, 40 in the Code row stand for coding categories; NC=Non Codable

RQ 2: What were students' perceptions of asynchronous instructional activities in the online learning environment?

The students' reflections were classified into student-student interaction, student-teacher interaction, and student-content interaction to determine their perceptions of the applied instructional activities. The reflections obtained from the students are devoted to the implementation of asynchronous learning activities in Cycle II.

Student-Student Interaction

The students reflect on the learning environment, and applying the instructional activities makes it easier for them to ask questions to their peers and the instructor without a time limit.

> *I enjoy ... because I can discuss with my classmates, and also directly to the teacher without being limited by distance and time. (Student A)*

In excerpts, student A enjoys interaction with peers and is motivated to be more courageous in discussing. Some students also state that through the instructional activities, they gain more knowledge from peer interaction and can easily give opinions to answer the questions of their peers.

> *I gained a lot of new knowledge that I obtained from the results of discussions with friends and teachers. … (Student B)*

> *This instruction as a tool can be more active in giving opinions, and answering questions from my friends...also gives advice ... who gives answers or opinions .... (Student G)*

Student-Instructor Interaction

Overall, the students responded very positively to applying the instructional activities in the learning environment. The excerpt of student B listed above states that it is easy to interact with their peers and their tutor.

The students also stated that with the application of the instructional activities, they were more willing to ask the tutor questions and answer the tutor's questions without hesitation.

> *At first, I was not comfortable ..., but after I followed it, I felt comfortable because I could provide answers and questions without hesitation and fear of being blamed. (Student G)*

Besides that, the communication that builds their motivation to keep asking and answering questions gives them the courage to interact with the tutor.

> *The tutor sees that I do well and helps me to do it well. I am motivated by being recognized and being told, "I see that you are good," which is important to me. (Student J)*

Student-Content Interaction

In terms of interacting with lesson content, it is easier for all students to interact with content. These synchronous learning activities stimulate them to prepare themselves for learning before class starts. In addition, they are motivated to read more to provide their opinions on the teacher and peers' questions.

> *I am more motivated to give my best... because ...I do not want to appear as someone who cannot solve problems. Therefore, I continue to prepare myself by reading the material before starting class. (Student H)*

> *I practice more and read more through these instructional activities. Even though I answer the quiz wrong, I can know which is right, which makes me understand this lesson more deeply. (Student F)*

Pre-post instructional activities drive students to focus more on lesson content. Students' interaction with the content of this lesson has an impact on their understanding of the lesson.

> *I think my skills improved because I tried hard to give myself time to focus on the lesson because instructional activities were helping me to focus … (Student A)*

I am becoming increasingly active in preparing myself to study. I read more and learned how to manage my time. Besides, I am getting more organized to divide my study time this semester. I made a very significant change in my time to study. I am increasingly disciplined in using time, and I am more ready to learn and be involved in it. (Student I)
When this class starts, I am afraid it will add an extra burden ... But having lived through it, the class made me more active ... I could give my opinion more clearly. (Student E)

In this study, the students initially proved to be a challenge. However, by the end of the process, many students were impressed with what they had collectively achieved. Almost all of the students were positive about their peers' support. They felt that collaborative learning helped them to develop their knowledge, have critical analysis, constructive criticism of the work of their peers, negotiate, take responsibility, and work in a team. The findings suggest that in order to reap these benefits, students need to be prepared with instructional activities that are friendly and easy to use.

Discussion

This action research study indicates that the implementation of learning activities can enhance student interaction in online learning. These instructional activities are designed and tailored to meet the specific needs of the students. It is crucial for students to increase their interaction and engagement in online learning. Pre- and post-class instructional activities are provided with ticket to the class and ticket out of the class, which allow students to interact and become more actively involved in the online learning environment.

Several key findings were obtained from this study. Firstly, the study demonstrated that adding asynchronous instructional activities can complement synchronous learning and enhance student interaction in online learning. This finding is supported by Yamagata-Lynch's (2014) research, which suggests that the implementation of a combination of synchronous and asynchronous learning methods is highly effective in increasing student engagement and interaction. Additionally, a study by Oztok et al. (2013) found that the use of synchronous and asynchronous learning methods, along with the instructor's role, is very effective in enhancing student interaction in online learning.

Secondly, this study reveals that instructional design tailored to the characteristics of learners, online learning environments, and appropriate tool selection are highly effective in enhancing interaction in online learning. This finding is supported by research conducted by Abrami et al. (2011). The study by Abrami et al. (2011) states that significant instructional design tailored to the characteristics of learners, along with the use of appropriate technology, can enhance various types of interaction, such as student-to-student interaction, student-to-teacher interaction, and student-to-content interaction.

Thirdly, the present study's findings demonstrate that student interaction with peers, teachers, and content increased after implementing various changes in the learning activities from Cycle I to Cycle II. These changes included the addition of pre- and post-class learning activities, consisting of ticket to the class and ticket out of class in the form of quizzes, discussion topics, and other tasks tailored to the students' backgrounds and needs. This played a pivotal role in enhancing student interaction and engagement. The teacher played a crucial role in modifying, creating, and adding instructional activities to improve student interaction in online learning. This action is also supported by Metler's (2017) opinion, which highlights the significance of educators' involvement in identifying and addressing challenges in the classroom learning process through action research. Therefore, the teacher's actions are critical in enhancing active learning that engages all students and content in the class.

Moreover, the instructional activities were designed to align with the learners' characteristics. The alignment of instructional activities with the learner's characteristics can support students to be actively involved, increasing student-to-student, student-to-teacher, and student-to-content interactions.

Fourthly, this study revealed that students became more actively engaged and interacted with each other due to feeling comfortable and not forced to complete the tasks assigned by the teacher. This finding is consistent with several previous studies that investigated learning activities (e.g., MacGregor and Lou, 2004; Lee et al., 2011, and Yang, 2017) revealing that learning activities are designed to support and facilitate student learning. These previous studies support the findings of this research that learning activities designed to support students in online learning will help them interact and facilitate their active involvement in class. Learning activities will also stimulate them to interact freely and adapt to their backgrounds and needs, inviting participants to be actively involved in the class. Furthermore, the instructional activities in the study were designed by considering the working backgrounds of the students. For instance, the study by Joyce et al. (2003) revealed that teachers should consider the learners' backgrounds before designing instructional activities in learning so that students can comfortably follow them.

Fifth, this study reveals that learning activities have proven to overcome complex interconnections and provide clear guidance for students in online learning. In addition to the Pre-Post class learning activities designed and implemented in this study, the success of online learning is also supported by the teacher's ability, content, and student's ability. Baldwin's (2007) study states that the success of online learning should not be dependent solely on the educator's ability, content, or student's ability but also on the online course design.

Finally, this study also shows that the implementation of Pre-Post class learning activities in this online learning environment was made asynchronously in the form of informal assignments and was more focused on Cycle II, so its effectiveness could impact student interaction in the online learning environment. In addition, this study reveals that the teacher's ability is crucial to ensure that learning activities can stimulate students to interact and engage actively. This finding is supported by Sembiring's (2018) research, which states that teachers play a significant role in implementing learning activities in online learning.

Conclusion, Limitations and Suggestions

Overall, the aim of this study was achieved as student interaction increased and they were more actively engaged. Students also stated that the Pre-Post class learning activities helped them improve their learning abilities. They were motivated to interact with peers and the teacher and learn the content. Additionally, the Pre-Post class learning activities applied in this asynchronous online learning environment complemented synchronous learning activities in the online learning environment. The limited time and status of the Indonesian migrant workers as students were factors that hindered their interaction in synchronous learning. However, the Pre-Post class learning activities overcame these weaknesses.

There were some limitations in this study, including the fact that it was conducted on a limited scope, namely the Indonesian learning environment in Taiwan, so it cannot be generalized to all online learners elsewhere. In addition, the number of participants in this study was relatively small, so further research with a larger number of online learners is needed. Furthermore, the duration of this study was very short, so it could not reveal the developments that emerged in the learning process over a relatively long time. Lastly, because this study was an action research involving teachers in the class, the results obtained in this learning cannot be generalized to other online learning environments with different teachers. However, this study can be a valuable resource to enrich the knowledge of teachers involved in online learning.

Further research can examine the impact of Pre-Post class learning activities on long-term student interaction in online learning by adding more learning activities. This study only focused on the application of Pre-Post lass learning activities in improving student interaction in online learning during

the activities. Further research can also examine the impact of these activities on learning outcomes, student behavior, and student satisfaction in online learning.

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