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Learning contradictions: does student social interaction occur in the middle of e-Learning?

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Abstract

During the period of the Covid-19 pandemic, distance learning is known to provide new numerous opportunities, in the interaction patterns between learning actors, in Indonesia. The inter-group competitive and collaborative learning methods have also been identified as options for increasing interaction, by paying attention to students' self-concepts. Based on being quantitative explanative, this research aims to determine the influence of both learning methods and the role of students' self-concept, on the interactions between members and groups. This research used non-parametric quantitative methods so moreover, 62 students were selected and divided into 2 classes, namely the control and experimental groups, each with 38 & 24 respondents, respectively. To determine the effect of competitive and collaborative methods between groups, as well as self-concept on students' social interactions, the authors use a two-way ANOVA test. The results showed that there was an influence of using collaborative learning methods on students with low self-concept towards their social interactions. However, there was no influence of students' self-concept toward their social interactions.

KEYWORDS: Collaborative Methods, Inter-Group Competitive, Self-Concept, Social Interaction.

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1. Introduction

The pandemic caused by the Corona virus (Covid 19) has reportedly brought extraordinary changes in all life sectors, including the education field. The learning process activities before the pandemic are carried out face-to-face, however, since the inception of the global disease, all process of education has been shifted online, as a form of preventing the spread of the Coronavirus (Rook, 2020). The consequences of implementing collaborative learning are found to be disturbed, due to involving peer interaction, in order to achieve project objectives as a current need in the context of higher education in Indonesia. Based on being unable to communicate and cooperate directly, technology media as a means of interaction and learning are observed to be needed. According to Aparicio et al., (2016), E-Learning is a technology, which served as a medium or means used during educational processes. There are several considerations that helped in determining the successful usage of e-Learning in the educational sector. These includes the existence of a mindset, as well as motivation and commitment from learning actors, in order to willingly carry out online collaborative learning (García-Valcárcel & Mena, 2016). According to Santosa & Degeng (2020), using E-Learning was potentially a means to collaborate, discuss, as well as exchange information and knowledge between the educators involved. The self-concept perspective of students with online WIL (Work-Integrated Learning), also observed positive conditions in completing projects, adaptability, flexibility, and resilience (Lindgren & Suter, 1967; Manis, 1955).

Based on the idea of increasing peer collaboration, which is considered as the limitation of e-Learning, this research aims to examine the influence of interaction-based learning and students' self-concept, in a bid to improve the level of social interaction, as well as complete independent project studies while undergoing online education. This model supports the opinion that the learning process is lifelong, as the educational goals

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does not only focus on gaining value. This indicates that it also develops social interaction as a skill for students, in order to be better prepared in confronting the challenges of the 21st century (Di et al., 2020).

1.1 Interaction based e-Learning

in conveying information, latest news, and learning content. Advances in communication technology, such as LMS (Learning Management System) and cellular systems, have been found to easily encourage interaction, both with lecturers and peers (Shirin et al., 2017). In the technology 4.0 era, advances in internet and communication technology reportedly eased educators, in order to offer dynamic multi-media resources to their students (Sitompul, 2019). Based on being in line with the role of technology, pedagogical models and educational strategies, distance or online learning is also part of the e-Learning concept (Dabbagh & Bannan-Ritland, 2005; Maudiarti, 2018).

Furthermore, cooperation-based methods, such as collaborative and competitive inter-group learning, are interaction-oriented models with the aim to improve students' educational outcomes and social aspects. Moreover, both are observed to have similarities in emphasizing interaction and communication. According to Hussin et al. (2019), Johnson & Johnson (1989), Le et al. (2018), Panitz (1999), and Sarwar et al. (2019), collaborative learning was interpreted as a set of teaching strategies, which encouraged students to actively participate in acquiring knowledge through dialogues, interactions, and feedbacks within their groups, via the traditional and online learning environments. Also, in the studies of Respati (2018) and Susilowati et al. (2019), four assumptions were observed, namely,

1. Learning is when an individual is actively involved in acquiring knowledge about a material,
2. Learning depends on the context being studied,
3. Students have differences, both in terms of background, learning style, experience, and character,
4. Learning is a social activity, due to containing interactions and communications, in order to form understanding and meaning that are possibly accepted by all parties involved in the educational process.

Therefore, the essence of the collaborative learning method is basically carried out in groups, as well as working together to achieve one goal.

According to Deutsch (1949) and Homans (1961), inter-group competitive learning is more motivating, due to a higher sense of belonging to the group, although there are similarities in emphasizing interaction and communication. This in turn encourages the presence of high competition between groups. According to Bornstein et al. (2002), Goldman et al. (1977), Julian & Perry (1967), there were 4 (four) indicators that were formulated in inter-group competitive learning, namely,

1. Learning is conducted in groups, in order to achieve one goal,
2. Learning do not have inter-group dependence,
3. There are competitions between groups, in order to be the best,
4. Competition has been defined as a social situation, where an individual's performance is superior to others, with one of them emerging as the winner.

Based on this understanding, a collaboration-based learning approach that emphasized interaction in e-Learning, emerged as an interesting subject to study. The extent to which students have sufficient requirements to observe themselves as well as have the will to learn in groups through different inter-group methods, are also found to determine their level of social interaction. Therefore, it is necessary to have students' understanding, adequate facilities, and complete guidelines that are related to technological aspects, as collaboration is stated to run optimally (Yadegaridehkordi et al., 2019).

1.2 Self Concept

One of the factors found to influence interaction and communication in learning is the students' self-concept. According to Suryanto et al. (2012), self-concept was defined as a belief about the inherent attributes in an individual, which were obtained through self-perception, reflection, or social comparison. Based on Lindgren & Suter (1967) and Manis (1955), the self-concept formed due to interactions between individuals and beliefs about themselves, was appropriate or valid because of others' confirmation and agreement. This was in line with the studies of Diswantika (2019) and Nurvinta (2017), which stated that there was a positive relationship between self-concept and social interaction.

Meanwhile, when associated with cooperative learning, Garshasbi et al. (2017), found that through this model, increased belief as a self-concept had an influence on students' self-efficacy, as well as the potential for achieving educational goals. Therefore, this emphasized the importance of students' self-concept playing a role with a cooperative learning model.

The students' perspectives in the WIL transferred online, also showed results that provided opportunities for independent and innovative creative works, as well as the adaptability and flexibility in taking risks, which in turn led to the construction of their own abilities (Hodges & Martin, 2020). Research by Hodges and Martin (2020) ultimately showed that the right students' perspective provided the potential to complete online WIL, which needed development, considering the fact that the virtual learning process is likely to become an increasing alternative. Therefore, WIL is observed to be a process, which includes formal and informal learning, that occurred in the wider work world. However, the difference is that the learning is planned, as it also has the ability to achieve certain outcomes from the higher education framework being offered (Fergusson et al., 2021).

1.3 Self Concept

According to Negara et al. (2019), social interaction is the relationship between individuals, where they are observed to influence and classify each other, according to character, form, and level (Kristanto, 2020). When viewed according to the character, social interaction is divided into three parts, namely interactions between individuals, groups, as well as both (individual & group). However, when viewed according to its form, social interaction is divided into two parts, namely positive and negative with interaction patterns, leading to the formation of good cooperation and competition (dispute or conflict), respectively.

In the context of online WIL with the SCL (Student Centered Learning) approach developed by Rook and McManus (2020), it was precisely emphasized that learning development needs to be designed, in order to produce interpersonal relationships between students, in an environment of mutual trust. This was suggested by Rock and McManus (2020), through the synchronous and asynchronous increase of teachers' attendance, discussion opportunities, and current event content, which encouraged students to discuss and debate, in order to formulate the solutions.

Also, it is clear that social interaction between students, which is understood as one of the final concepts of the WIL learning model, is an important part that needs to be measured. This was in line with Kristanto (2020), which stated that the teaching process as an interaction, involved a complex procedure between learning actors, which in turn was observed to cause a positive dependence.

In the control class, students are given discussion materials with themes related to the importance of ethics in doing business, especially in taking advantage and relationships with related parties based on the values of virtue that apply in society. In obtaining material for the discussion, they can seek from various sources either through direct interviews with the business person, or from online media such as You Tube. They compete between groups to defend their respective opinions. The form for group assignment output used in the midterm exam is in the form of a Contextual Business Ethics Project Proposal and for the results of the assessment at the end of the semester in the form of a Portfolio of Group Results & Individual Reflections and peer review data from peers / the public.

In the experimental class, the theme of the discussion that will be used as study material is everything related to entrepreneurship. The groups collaborate to find sources of knowledge about entrepreneurship, and they can get it through interviews, social media, or other means.

The basis for the assessment carried out during the midterm and end of semester exams is the team's Business Plan Presentation Video (+/- 8 minutes), peer review data from colleagues / the public and the Log Book Group. However, at the end of the semester, they must upload a track record of achieving progress on social media.

2. Purpose and hypothesis

The measurement level of the result differences on student social interaction achievement between inter-group learning methods (collaborative & competitive), is a follow-up to the importance of an SCL-based model, which is to be applied in the online WIL platform. This certainly had theoretical and practical implications on the practice of implementing online WIL, for higher educational context.

Therefore, the problem formulation in this research is to examine the influence of the interaction-based e-Learning model and self-concept, towards students' social interaction in independent project-based learning. The research questions are as follows:

H1: Is there a significant difference between the students' social interactions with the collaborative and competitive e-Learning models?

H2: Is there a significant difference between the students' social interactions with high and low self-concepts?

H3: Is there a significant interaction between the interaction-based e-Learning model and self-concept with students' social interactions?

3. Method

3.1 Design and variables

This research is a quasi-quantitative experiment, which compared the experimental and control classes. In order to ensure that this research used a collaborative learning approach based on group interaction, the two classes were conditioned to have groups that performed equally. This group formations in both types of classes were carried out using the material test measurements. Based on this test result, these groups in the control class and experimental class were formed from students whose study outcomes complemented each other. Therefore, each group had almost even performances, with an average size of four to five people.

The experimental and control classes with five & nine groups, respectively, were then ready to measure their high and low self-concept. Also, they were provided with an online pre-test, which is used to measure the social interaction level (O1 and O3). Additionally, these online interactions were certainly experienced by each individual. Therefore, online interaction learning was reportedly used in the middle of the semester before this experimental research was carried out. This was found to allow group formation and online pre-testing of social interactions to be conducted. In the middle of the next semester, the experimental and control classes were to be provided with collaborative and competitive e-

Learning treatments (X1 & X2), as an online WIL application, respectively. At the end of the semester when the independent projects carried out by the groups were over, both classes underwent a post-test, in order to measure their social interaction level (O2 and O4). The complete procedure of this research is illustrated in Table 1. Based on this research design, there were three variables involved, namely,

1. Independent variables: This includes collaborative and competitive e-Learning.
2. Moderate variables: This includes the high and low student self-concept.
3. Dependent variable: This includes the students' social interaction.

3.2 Participants

The participants were the higher education students at Widya Kartika University, Surabaya, Indonesia. Moreover, a total sample of 62 students that took the Bachelor of Management and Business Study Program in the 5th semester of the 2020/2021 period, were selected for the research. A cluster sampling technique was also used, due to the consideration of class willingness as an object of online WIL experiment, for both the experimental and control groups (Creswell, 2009).

Furthermore, based on the formula of Federer (1967), the sample size selection still met the following rules:

$$(t-1)(n-1) > 15$$

where t & n = number of treatments and participants, respectively.

The details of the research sample are given in Table 2.

4. Results and Discussion

4.1 Instrument test results

The self-concept and social interaction instruments consisting of 16 & 17 indicators, were observed to have produced 11 & 10 variables, respectively, as shown in Table 3.

4.2 Description of research variables

In this research, a class description was obtained when measuring the self-concept variable, as shown in Table 4. The total sample of the male students was observed to be 63% (39) more than the females, which was at 37% (23). This number consists of male students who have low self-concept as much as 15% (9), and those who have high self-concept as much as 48% (30), meanwhile for female students who have low self-concept as much as 13% (8), and those who have low self-concept high self as much as 24% (15). However, the sample with high self-concept was 72% (45) more than those that were low, which was at 28% (17).

In this study, to measure the social interaction of students, the authors used the Linkert scale with a score of 5. Tests for measuring social interaction were carried out twice, namely during the pre-test and post-test.

The lowest pre-test score for the control class was 2.1 and the highest score was 4.3, while for the experimental class the lowest score was 2.7 and the highest score was 4.2.

Group	First Middle Week of Semester			Second Middle Week of Semester							
Week	1-5	6-7	8	9	10	11	12	13	14	15	16
Experiment	Familiarity with e-Learning interactions	Material Test & Group Forms	Measurement of Self-Concept	O1	Collaborative e-Learning (X1)						O2
Control				O3	Competitive Inter-group e-Learning (X2)						O4

Table 1 - Research procedures.

Group	Model	Class	Students
Experiment	Collaborative e-Learning (X1)	Entrepreneurship and Business Management	24
Control	Competitive Inter-group e-Learning (X2)	Business Ethics	38
Total sample			62

Table 2 - Number of Research Samples.

Variable		Indicator	Spearman ρ	α (*if item deleted*)	α Total
Self-Concept	1	Good assessment of course material	0.517*	0.741	0.757
	2	Understand the lecture material compared to others	0.705***	0.716	
	3	Trying to find course material by yourself	0.431*	0.751	
	4	Have no difficulty in understanding the material	0.661***	0.723	
	5	Able to do a good job	0.586**	0.734	
	6	Able to understand assignments well	0.711**	0.718	
	7	Have high aspirations	0.421*	0.745	
	8	Trying hard to make things happen	0.421*	0.745	
	9	Feeling that people like me	0.558**	0.736	
	10	Feeling useful for many people	0.553**	0.735	
	11	Feeling accepted when in a group	0.503*	0.738	
Social Interaction	1	Have lots of friends	0.547**	0.697	0.714
	2	Easy to get along	0.441*	0.693	
	3	Understand the feelings of friends	0.707***	0.693	
	4	Respond to criticism	0.517**	0.697	
	5	Easy to adapt	0.419*	0.694	
	6	Understand other people's judgments	0.726***	0.698	
	7	Help a friend	0.505*	0.700	
	8	Be sensitive to other people's feelings	0.503*	0.699	
	9	Socialization ability	0.610**	0.684	
	10	Break up disputes	0.561**	0.693	

Note. *p < .05, **p < .01, ***p < .001

Table 3 - Test results of research instruments.

The results during the post test the lowest score for the control class was 2.3 and the highest score was 4.7, while in the experimental class, the low score obtained was 2.1 and the highest score was 4.9.

Based on the comparison of the mean scores in the two classes, the description related to the achievement of the social interaction variable results also showed that there was a difference between the pre and post tests, as illustrated in Table 5. In the pre-test condition, there was almost no significant difference in the mean scores between the control and experimental classes, with just slight contrasts observed. However, in the post-test stage, it was found that the conditions for improvement was obtained on the results of the mean score, which was observed in the experimental class. Even though the difference in this stage's (post-test) mean score between the experimental and the control classes reached 0.16, it was still higher than that of the pre-test.

Variable	Gender		Total Sum (%)
	Male Sum (%)	Female Sum (%)	
Low Self Concept	9 (15%)	8 (13%)	17 (28%)
High Self Concept	30 (48%)	15 (24%)	45 (72%)
Total	**39 (63%)**	**23 (37%)**	**62 (100%)**

Table 4 - Distribution of Research Samples based on Sum of Gender and Self-Concept Variables.

Social Interaction Variables	Mean		Mean Difference
	Control Class	Experiment Class	
Pre-test	3.32	3.47	*0.15*
Post-test	3.59	3.75	*0.16*

Table 5 - Mean comparison of the social interaction variables.

4.3 Anova test results

Furthermore, the normality and homogeneity of data requirements should be met before the ANOVA or independent comparison analysis of social interaction variables. The normality test was observed to use the Shapiro Wilk with a significance value greater than 0.05, resulting in the outcome stating that the data were found to be normally distributed. Meanwhile, the Levene test that showed a significance value greater than 0.05, indicated that all data were homogeneous. Based on the initial test results, the data were found to be normally distributed and homogeneous during the pre and post test conditions, therefore, resulting in the continuity of the Anova analysis.

Homogeneity of Variances Test (Levene's)				
	F	**df_1**	**df_2**	**p**
Pre Test	0.0711	3	58	0.975
Post Test	0.504	3	58	0.681

Table 6 - Homogeneity tests.

Based on Table 6, the Levene's Test of Error Variance Equality showed that the results of the pre and post test P-values were 0.975 & 0.681, respectively. Due to both P-values found to be greater than α =0.05, the data variants were then assumed to be similar or accepted (Suyanto, 2009). Therefore, this showed that the population variants were similar. Meanwhile, the results of the normality analysis also showed that both pre and post test P-values were greater than α = 0.05, at 0.359 and 0.123, respectively (see table 7). Therefore, the data from the population were found to be normally distributed and accepted Suyanto, (2009).

Test of Normality (Shapiro-Wilk)		
	Statistic	**p**
Pre Test	0.979	0.359
Post Test	0.969	0.123

Table 7 - Normality tests.

Additionally, the calculation of statistical analysis was carried out via the two-way Anova test. The first and second ANOVA tests were both conducted, in order to measure the influence of self-concept towards students' social interactions, before and after the interaction-based e-Learning treatments were to be carried out, respectively.

	Sum of Squares	**df**	**Mean Square**	**F**	**p**
Overall model	4.535	3	1.512	2.74	0.051
LEARNING METHODS	1.459	1	1.459	4.05	0.049
SELF CONCEPT	0.522	1	0.522	1.45	0.234
LEARNING METHODS ✻ SELF-CONCEPT	2.554	1	2.554	7.09	0.010
Residuals	20.909	58	0.360		

Table 8 - Anova - Post Test Social Interactions.

The results of the Post-Hoc Test in Table 9 also some of the things below:

1. The P-value for comparison between students with low and high self-concepts in the competitive group was 0.582 (> α = 0.05). This showed that there was no difference in social interaction, between students with low and high self-concepts in this group.
2. The P-value for comparison between students with low self-concept in the competitive and collaborative groups was 0.034 (< α = 0.05). This showed that there are differences in social interaction, between students with low self-concepts in the competitive and collaborative groups.
3. The P-value for comparison between students with low and high self-concepts in the competitive and collaborative groups was 0.906 (> α = 0.05), respectively. This showed that there was no difference in social interaction, between students with low and high self-concepts, in the competitive and collaborative groups, respectively.
4. The P-value for comparison between students with high and low self-concepts in the competitive and collaborative groups was 0.198 (> α = 0.05), respectively. This showed that there was no difference in the social interaction between students with high and low self-concepts, in the competitive and collaborative groups, respectively.
5. The P-value for comparison between students with high self-concepts in both the competitive and collaborative groups was 0.935 (> α = 0.05). This showed that there was no difference in social interaction between students with high self-concepts, in both groups.
6. The P-value for comparison between students with low and high self-concepts in the collaborative group was 0.097 (> α = 0.05). This showed that there was no difference in the social interaction between students with low and high self-concepts in this group.

The results showed that the interaction-based learning method at the end of the semester, had an effective influence on the outputs of student social interaction in online learning. This was in line with Apriono (2016) and Chen & Chiu (2016), which stated that there was an influence, when using the competitive and collaborative methods on students' social interactions. As illustrated in Table 5, it was also observed that there was an increase in the results of social interaction, after being

Comparison					**Value**			
LM	**SC**		**LM**	**SC**	**MD**	**SE**	**df**	**Sig.**
C	L	-	C	H	-0.252	0.197	58.0	0.582
C	L	-	E	H	-0.806	0.287	58.0	0.034
C	L	-	E	H	-0.140	0.206	58.0	0.906
C	H	-	E	L	-0.555	0.277	58.0	0.198
C	H	-	E	H	0.112	0.191	58.0	0.935
E	L	-	E	H	0.667	0.283	58.0	0.097

Table 9 - Post Hoc Comparisons - Learning Methods ✻ Self-Concept.

NOTE:
LM (Learning Method): C (Control Class or Competitive Group), E (Experiment Class or Collaborative Group), SC (Self Concept): L (Low Self Concept), H (High Self Concept), MD (Mean Difference), SE (Standard Error), df (degree of freedom), Sig (Significancy/P-value)

provided with the competitive and collaborative method treatments. However, there were differences in the results of the Post Test in the two methods, where the collaborative mean is higher than of the competitive. Therefore, this showed that the collaborative methods were better used in interaction-based e-Learning than the that of the competitive. The results of this research were also in line with the theory of Gutiérrez-Braojos et al. (2019) and Jordan et al. (2017), which stated that there was no benefit to be salvaged in the use of the competitive method, because there was no positive dependence on the participants, as they only wanted to collaborate with the same group of friends. Therefore, the collaborative method was better used in increasing social interaction, compared to that of the competitive.

Therefore, the teaching method based on the objective structure, which emphasized the fostering of cooperative relationships, had a higher learning quality than competitive conditions. Also, collaborative learning design was considered more consistent with learning objectives, due to the fact that all students had the abilities to achieve goals, via the utilization of their respective attributes, as well as those possessed by teachers and other pupils. Similar results were also stated by Johnson & Johnson (2013) and Slavin (1996), that collaborative learning improved students' learning outcomes and social aspects. Furthermore, collaboration was a work model that required human involvement, due to being promising and becoming a trend in the twenty-first century. Moreover, the need to think and cooperate together in response to critical issues, had also increased (Austin, 2000; Welch, 1998). Therefore, it was concluded that the interaction-based learning method was carried out on e-Learning, with the success of its implementation depending on the roles of lecturers, in becoming a facilitator and mediator for students. Also, it created academic conditions, which were observed to stimulate interaction and active participation for learning participants (Alghasab et al., 2019).

Meanwhile, the role of self-concept via the use of competitive and collaborative methods, showed that there was no difference in students' social interaction. These results were supported by Yunistiati et al. (2014), which stated that there was no relationship between self-concept and students' social interaction. This was because students with high and low self-concepts do not necessarily have good and bad quality social interactions and vice versa, respectively. Based on this research, there were other several conditions that possibly caused the absence of the influences, which were related to self-concept on students' social interactions namely, lack of experience regarding online learning (Kumi-Yeboah et al., 2018), and the second is, that although students' self-concept can experience instability, but this does not change their social behavior when they interact with their peers as stated by Ellemers et al. (2004)

Finally, there was a relationship regarding the influence of learning methods and self-concept, on students' social interactions. This hypothetical results were in line with Ellemers et al. (2004), which stated that collaboration was influenced by social Identity, as an aspect of an individual's self-concept. According to Tajfel Tajfel & Turner (1985), social Identity was an individual's self-definition, in relation to several public group memberships associated with value connotations and emotional significance. Therefore, the more individuals seek similarities in their social group, the greater it encourages them to collaborate with other members. Ellemers et al. (2004), also emphasized that due to the fact that students had backgrounds, experiences, values, perspectives related to self-concept, and diverse learning styles, the use of different tools, methods of communication, and collaboration are needed, in order to complete their task effectively.

According to Marsh et al. (1983), there were two benefits of conducting group identification, namely,

Supporting collaborative efforts, because it made group members feel connected to others.

Perceiving their self-esteem, which was related to group results and performance.

Similarly, the inter-group competitive method viewed that the definition of self-concept originated from the comparison between the characteristics possessed by group members, compared to the relevance of external categories. Brewer & Gardner (1996), Johnson & Johnson (2013), Sharan (1980), and Slavin (1996), also stated that collaboration and competition were more effective in generating learning and achievement in many areas of academic subjects, attitudes, influences, and a more positive academical self-concept, compared to the interpersonal competitiveness and individualistic goal structures.

However, when using the inter-group competitive method, there was a decrease in self-concept, due to intervention or pressure to be the winner. This does not lead to the achievement of goals, as it was observed to have a negative impact on the comparison standards used for self-evaluation (Marsh et al., 1983). This was in line with a situation observed by this research, in terms of the differences related to the effective social interactions in the collaborative and competitive model treatments, with various self-concept conditions.

5. Conclusions and recommendation

5.1 Conclusion

Based on the hypothetical testing, discussions, and results, several conclusions were made as follows:

The students' social interactions using collaborative and competitive e-Learning models, showed a significant difference, therefore, supporting the first hypothesis. The results in the control and experimental groups, which used both competitive and collaborative methods, experienced an increase in social interactions, during the post-tests, respectively. However, the results of social interaction using collaborative methods were greater, compared to that of the competitive. This showed that the collaborative method was the better interaction-

based method used during e-Learning, due to no intervention or pressure to be the best, as all group members worked together to achieve similar goals.

Students' social interaction with high and low self-concepts also showed no significant difference, therefore, not supporting the second hypothesis. However, there was an influence on students in the experimental group with low self-concept, as they experienced an increase in social interaction, while using the collaborative method. Also, they had more ability to interact socially, as well as participate actively during the online learning process.

The students' social interaction via the use of the interaction-based e-Learning model and self-concept, showed a significant difference, therefore, supporting the third hypothesis. Also, the use of collaborative learning methods on students with low self-concept had an influence on their social interactions, while using e-Learning.

This indicated that the collaboration process carried out by e-Learning, was in line with the social interaction possessed by students with low self-concepts, as they were willing to participate and play an active role in carrying out this learning process. However, the use of competitive and collaborative learning methods in the control and experimental groups, does not have an influence on social interactions, as well as students with high and low self-concepts.

The results of the hypothesis that show the failure of collaborative learning through e-Learning are caused by many factors. These factors are due to their lack of knowledge and experience about collaborative learning methods, when using e-Learning. This also caused them to be reluctant in carrying out the learning process, as they do not want to actively participate in it. According to Aboagye et al. (2021), students were already attached to a conventional approach, therefore, when they have to use a new method, they possibly encountered obstacles. This was because sometimes, they were still attached to the pedagogy and propositions received. Therefore, students had fears and concerns about challenges, when adopting a new approach. Their reluctance to adopt new approaches was likely to also result in the failure to implement the entire process. Therefore, when there is no motivation from learning actors to actively involve and participate, interaction-based e-Learning does not have any influence on them.

5.2 Empirical suggestions

This research is limited by several factors, including the limitations in conditioning other influencing variables, such as students' backgrounds, experiences, values, perspectives, and the number of samples. This is found to encourage the research to lead to a quasi-experimental approach, as a form of modeling.

Further plans are also developed from this research limitations, by involving aspects of other influential variables on students. Also, it involves more systematic planning, to limit the influential variables that appear with longer periods and similar samples, in order to obtain better results.

5.3 Pratical suggestions

Based on students' interaction and motivation, it is necessary to have a technical approach through the introduction of LMS and other educational methods, in order to achieve learning objectives. Also, in order to achieve the ability and motivation of students, measurements are to be carried out regularly.

The approach adapted by teachers/lecturers should also be supported by related institutions in the form of regulations, where it possibly has an impact on budgeting, work programs, and provision of incentives.

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