THE EFFECT OF COLLABORATIVE REASONING ON INDONESIAN UNIVERSITY STUDENTS' LITERACY AND ARGUMENTATION SKILLS

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Abstract: Since the global COVID-19 pandemic, traditional classrooms have no longer become accessible for everyone. Most teaching and learning process is conducted virtually. The use of interactive and dynamic pedagogy is needed to maintain the quality of learning,

especially that enhance argumentation and literacy skills. This research aims to examine whether there are differences in literacy and argumentation skills of Indonesian university students before and after the implementation of Collaborative Reasoning (CR) approach during online learning. A quasi-experimental one-group pretest-and posttest design was employed. A total of 30 students taking Communication and Gender course were involved in this research. We developed a Reading Comprehension Test (RCT) to collect the literacy scores of the students and Cognitively Based Assessment of, for, and as Learning (CBAL) Argumentation Progression to measure argumentation scores. Using a paired samples t-test, the literacy and argumentation scores of the students before participating in CR were compared to their scores after participating in CR. The literacy and argumentation scores were significantly higher after participating in CR. This finding indicates that there is an increase in literacy and argumentation scores over time that was not likely to be due to chance. It is pivotal then for language educators to consider CR in their classrooms.

Keywords: *Argumentation, Collaborative Reasoning, Dialogic Teaching, Literacy*

INTRODUCTION

Dialogue is a tool to develop human thinking ability. Bakhtin (1981) states that the basis for the formation of human knowledge is not only personal identity, but also dialogue that involves more than one individual so that there is a sharing of emotions, opinions, experiences, and activities. The same opinion was also conveyed by Vygotsky (1978) that humans can develop higher mental functions through dialogue with other people.

Unfortunately, learning approach that emphasizes the importance of dialogue in the classroom has received very little attention from researchers in recent years. Influenced primarily by

sociocultural learning theory, several researchers have recently begun to design and apply analytical concepts and tools to examine classroom discourse and its dialogic nature (Garas-York & Almasi, 2017; Murphy et al., 2009; Zhang, Anderson, & Nguyen -Jahiel, 2013; Zhang et al., 2016). Although still rare, such research provides important information about teacher-student, student-teacher, and student-student interactions in the classroom. They also explain the methodological strategies that are needed to measure important aspects of argumentative discourse, such as mapping classroom interactions or analyzing relationships between topics and ideas expressed by discussion participants.

Collaborative Reasoning (CR) is a small group discussion approach led by students independently in the classroom. Unlike traditional class discussions which emphasize mastery of information in text, CR aims to stimulate reading and critical thinking (Lin et al., 2018). Support for this theory has been demonstrated by Dong, Anderson, Kim, and Li (2008) in their study of the responses of Chinese and Korean students to CR. Thirty-six Chinese students (18 from Ma Anshan and 18 from Longshan) and 18 Korean students (from Daegu) were the subjects of the study. The qualitative analysis showed that the students used 12 strategies similar to those of students in the United States in the study of Anderson et al. (2001) without the dominance of the teacher.

For example, the students used strategies such as "What if [SCENARIO]?", "If [ACTION], then [BAD CONSEQUENCE]", and various "Fine Words [PROPOSITION]" to express their opinion. This finding confirms the hypothesis of the snowballing strategy in discussing and developing dialogue. That is, when one dialogic strategy is used effectively in a discussion, it can spread to be used by other subjects with increasing frequency. In addition, Chinese and Korean students also used sources from different texts to support their arguments in the discussion. This shows that the students can develop connections between texts (intertextuality) to enrich the discussion.

Similar research findings were also reported by Zhang et al. (2013). They even added that the students in the CR condition were able to improve writing reflective essays to be longer with a richer vocabulary, more relevant reasons, counter-arguments, and the use of evidence from the appropriate text. This finding confirms that through CR, students develop argument schemes that give them access to transfer the reasoning skills gained from oral discussions (dialogues) into individual persuasive writing tasks with a total argument effect size number ranging from 0.45 to 0.68 (Reznitskaya et al., 2008).

According to Zhang and Stahl (2011), Collaborative Reasoning (CR) is a learning approach that promotes dialogue in expanding communication opportunities and encouraging the development of language and thinking skills of students. In CR, students are encouraged to determine standing points, prepare their arguments with statements and evidence from reading texts, and discuss with other students through counter-arguments and rebuttals (Lightner & Wilkinson, 2016). Theoretically, participation in this discussion helps students to build or internalize arguments, by explaining and justifying, configuring, and using rational arguments (Reznitskaya, et al., 2008). Through participation in CR, students can use certain argumentation strategies or functional rhetoric strategies, and other students can imitate them to develop their own arguments. This process occurs in a snowballing manner that continues to develop during the discussion process (Zhang & Stahl, 2011).

Despite the growing interest in research about argumentation and literacy skills of students in traditional classroom, a little is known how such skills can be developed in an online learning environment. Today, with the global spread of COVID-19 that forces learning to be conducted virtually, literacy and argumentation skills remain the two skills that must be mastered by students, especially to compete globally in the era of the industrial revolution 4.0. As such, we argue that fundamental benefits of CR as dialogic approach to classroom discussion can still be applicable in an online classroom. In spite of the challenges during the COVID-19 pandemic, students should continue

to receive quality learning in order to have broad insight, good language skills, and the ability to argue (Sukmayadi, 2020) either in traditional or online classroom. Good language skills are the basic capital to improve student communication in interacting with the international community, while proficiency in argumentation is the basic ingredient in improving students' ability to make decisions based on logical and factual analysis.

In addition to the arguments above, literacy is also one of the priority programs of the Indonesian government as outlined in the Regulation of the Minister of Education and Culture Number 23 of 2015 concerning the Development of Character Education. Therefore, character and literacy development is a comprehensive effort carried out through educational ecosystem in the family, school, college, and community environment (Azmazaki, et al., 2017). Unfortunately, in a current study, Gustine (2018) argued that most literacy program or learning in Indonesian contexts is typically conducted in the context of teaching English and is situated in school settings. Even those literacy programs do not focus on developing critical literacy skills of the students like argumentation or critical thinking skills due to the fact that the teachers lack of knowledge in delivering didactic instruction with literacy as the methodological approach.

Online learning also has the potential to significantly improve intellectual quality and learning outcomes (Garrison, 2009). Online learning provides a more flexible space than conventional learning because it can bridge the time-place gap, and provide students with greater access and flexibility. Online learning can be effective if it is carried out using effective pedagogy, including structured and individual-centered learning mechanisms in an online communication environment (Liaw & Huang, 2013).

In line with the explanation above, changes in the pattern of higher education in Indonesia are happening very quickly caused by the global pandemic Coronavirus Disease 2019 (COVID-19). To prevent the spread of COVID-19, the Indonesian government has limited all public activities since March 2020, including closing school

and campus activities (Mona, 2020; Yunus & Rezki, 2020). All learning activities are transferred into online and universities must adapt to digital technologies. Several challenges and difficulties are raised.

Mursyidin, Parlindungan, and Rahmatillah (2021) mention that 57 lecturers from various universities in Indonesia are struggled to use accessible online platform for their teaching due to the fact that most of their students live in remote areas with limited internet access. Additionally, the teaching pattern is typically oriented towards teacher-centered in which the main goal is simply to get things done instead of focusing on the students' learning process. Aljuaid (2021) who investigated the challenges and difficulties experienced by college students learning English online during COVID-19 outbreak in Saudi Arabia also found similar challenges. He maintains that challenges in online English classroom include students' negative attitude, lack of tutor training, poor technical support, difficulty accessing curriculum content or tests, concerns about safety or privacy, slow internet connection, students' lack of computers, and reliable internet. However, despite the technological difficulties and challenges, online learning of English courses still positive effect on the student's literacy skills, such as improved interactivity, communication, enhanced language proficiency, discussion forums, improved writing quality, learning flexibility, and enhanced grammar and vocabulary acquisition.

The present study, thus, seeks to develop an evidence-based argument that literacy and argumentation skills of university students in Indonesia may be developed through Collaborative Reasoning (CR) approach to classroom discussion. In particular, this study adds to the existing knowledge that focuses on the dialogical aspects of classroom discussion in an online learning environment for college students Therefore, in general, this study aims to analyze whether collaborative reasoning as a dialogical approach to classroom discussion has an impact on students' literacy and argumentation skills during online learning.

METHOD

This study uses an experimental method with a quasi-experimental one-group pretest-and-posttest design. Allen (2017) asserts that the one-group pretest-and-posttest design research can be used when there is only one group of participants and it is not possible for the researcher to modify the group into two different groups. In this research design, one group of participants was given a pretest, then received treatment, and was given a posttest to see if there were differences in literacy and argumentation abilities before and after being given the treatment.

The participants involved in this study were 30 students (17 women and 13 men) who took the Communication and Gender course in the even semester of the 2020/2021 academic year. It was chosen because the course was taught by the first and third researchers, so it was convenient for the researchers to conduct the study. The 30 students were listed as students with different social and cultural backgrounds. Most of the participants came from Aceh Province, Indonesia. Before being involved in this study, each participant received a complete explanation of the objectives and procedures of this study and asked to sign an informed consent. Every student has the right to choose to be involved in this research or not. All participants' identities are kept confidential both during the research and at the time of scientific publication. Their involvement in this research did not affect their grades in the course or other campus academic activities.

There were two instruments used in this study. The first was the Reading Comprehension Test (RCT) which was developed by researchers to measure students' literacy skills. This RCT consisted of 30 multiple choice questions with four different texts. The text is an argumentative text taken from the Down To Earth Bulletin, Special Edition, No. 99-100, 2014. The RCT instrument had been previously tested for the validity and reliability measurement to 20 university students who did not take the Communication and Gender course. The composition of the questions can be seen in Table 1 below.

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Table 1. Composition of reading comprehension test

Content of questions	Number of items
Main idea	4
Stated information	8
Implied information	8
Word meaning	10
Total questions	30

The second instrument adopted the Cognitively Based Assessment of, for, as Learning (CBAL) Argumentation Progression which was previously developed by Deane and Song (2014) to measure students' argumentation skills. It categorizes dialogue progress into cycles, such as understanding the stakes, exploring the topic, considering positions, creating, and evaluating arguments, and compiling and presenting arguments. The construct of argumentation ability for university students can be seen in Table 2 below.

Table 2. Argumentation competency for university students

Category	Social	Conceptual: Building argument	Conceptual: Building argument	Discourse
	Building rebuttal	Taking position	Reasons & evidences	Building the case
Advanced	Demonstrate a good rhetorical (metacognitive) understanding of persuasion	Able to use other people's arguments to build their arguments, then use those arguments to direct the discussion	Build a systematic debate model, and use that model to build his knowledge	Build proficiency in various forms of argument, demonstrate understanding and control of various genres of argument flexibly.

To measure students' arguments, this study used Table 2 above as an assessment rubric by using a Likert Scale. During the pretest and

posttest, students were given four different scenarios for each test and they were asked to express their opinion about these scenarios. For example, study Table 3 below which describes the scenario and instruction.

Table 3. CBAL argumentation progression scenario and instruction

Scenario	Some parents give money to their children to do homework as compensation. However, some parents want their children to do homework without any reward as part of their responsibilities.
Instruction	What do you think about the above situation? Should parents pay their children to do homework?

This research was divided into three stages of research, namely pre-intervention (preparation), intervention (treatment), and post-intervention (post-treatment). At the pre-intervention stage, all participants received a pretest using the RCT and CBAL instruments. The pre-test was conducted in a face-to-face (conventional) classroom mode. The results of the pretest were used as a baseline to compare the participants' abilities before and after treatment. Next is the intervention or treatment stage. Participants received a learning process using the Collaborative Reasoning (CR) approach. Unlike the traditional classroom situation, the treatment was conducted virtually through Zoom Meeting.

This online learning took place for 12 CR sessions over 3 months (1 session per week) with a duration of 90 minutes per session. During the treatment, participants read text taken from the Down to Earth Bulletin column 2014 edition 99-100 as the reading material. The reading material was delivered digitally in which the participants read it in their own tools, such as laptop or smart phone. The topic of the text included controversial issues in the society, for example "Indonesian Women and Palm Oil Plantation". We gave them central questions related to the text that initiated discussion, such as: does

women in palm oil plantation receive equal wages as men? Why women were treated differently in palm oil industry? Then the participants ware asked to take a stand (standing point: agree or disagree) about the central question and present it in the forum. After that, the participants were sent into Breakout Rooms of four students. The researcher was present in each Breakout Room.

The participants were encouraged to develop their ideas based on their respective positions with reasons and supporting evidence from texts and everyday experiences. During the discussion process, the participants compete with each other in arguments and thought processes (dialogical). The researchers who were present at the Breakout Rooms limited their involvement in the discussion and made sure every participant has equal chance to participate. After an hour of discussion, we sent back the participants into the Main Room and took a final poll at the end of the discussion to see how far the discussion was going; and Finally, we reviewed the discussion as a whole and concluded recommendations on how to improve future discussions. In the last stage, post-intervention, participants were given a posttest using the RCT and CBAL instruments that have been designed for the posttest. The posttest was conducted offline in a face-to-face (traditional) classroom setting.

The data in this study are quantitative data from the results of the participants' pretest and posttest. The data analysis method includes statistical calculation of the average value through the normality test, homogeneity test, and the different test of two averages. The normality test was conducted to see the normal distribution of the data that had been collected using the Kolmogorov Smirnov test. After the normal data distribution is obtained, the homogeneity test will then be carried out to see whether the variances of the two values are different. After testing the variance, a different test of the two averages

was carried out to see the difference in the average value (gain) before and after treatment using the Paired-Sample t-Test.

FINDING

The objective of this study is to examine the differences in argumentation and literacy skills of undergraduate students before and after participating in Collaborative Reasoning. This research was carried out since the even semester of the 2020/2021 Academic Year. The subjects were students who took a course taught by the lead researcher, namely Communication and Gender. Data collection has been carried out for 16 meetings, which are divided into pre-test, intervention, and post-test. 30 students stated that they were willing to be involved in this study, with details of 13 males and 17 females.

Using a paired sample t-test, literacy scores of undergraduate students prior to participating in Collaborative Reasoning (CR) were compared to their literacy scores after participating in CR. Literacy scores were significantly higher after participating in CR (M = 77) than before participating in CR (M = 58) as indicated by a significant t-test, $t(29) = 10.64$, $p < 0.05$, $d = 19.2$. Similar results also found in the students' argumentation scores in which argumentation scores after participation in CR were significantly higher (M = 74) than before participating in CR (M = 57) as indicated by a significant t-test, $t(29) = 13.45$, $p < 0.05$, $d = 0.99$. These findings indicate that there was an increase in students' score over time that was not likely to be due to chance.

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Table 4. Paired samples test

					Paired Differences				
			Std. Error Mean		95% Confidence Interval of the Difference				Sig. (2-tailed)
		Std. Deviation		Lower	Upper	t	df	
	Mean								
Pair 1	Literacy_Post - Literacy_Pre	19.5000	10.0301	1.8312	15.7547	23.2453	10.649	29	.000
Pair 2	Arg_Post - Arg_Pre	16.5000	6.7146	1.2259	13.9927	19.0073	13.459	29	.000

DISCUSSION

The current study aims at finding out whether there is a significant difference in students' argumentation and literacy skills after being exposed to repeated CR sessions for three months. The findings of this study support previous research conducted by Reznitskaya et al. (2009). As a dialogic approach, CR promotes a strategic mechanism for the development of literacy and argumentation skills. When students are exposed to argumentation activity, they are trained to be critical since argumentation is a type of reasoning that encourages problem-solving and processing of information (Duschl & Osborne, 2002). As this study has been carried out in one semester, CR improves students' understanding of the materials through continuous group discussion in which they can exchange ideas, clarify, or amend their perspectives during the discussions (MacArthur et al., 2002).

As has been mentioned in many studies, this research also agrees upon a consensus that CR is a teacher-scaffolded, peer-led, small-group discussion approach that provides students with an environment to engage in productive academic talk. Lin et al. (2018) also argue that CR gives students opportunities to continuously

develop academic language through active participation in a discussion with peers. Furthermore, previous research conducted by Hajhosseiny (2012) has identified some benefits of dialogic approach implementation on improving students critical thinking elements (self-evaluation, open-mindedness, truth-seeking, self-confidence to share their ideas, wisdom, and being analytical) and social interaction elements (getting to know each other, willingness to conversate, being responsible, classroom engagement, teacher-student interaction, and student-student interaction). It is important to note that students literacy skills will take place when students are engaged in a meaningful and effective teaching (Che Musa et al., 2012).

The above statement resonates with Vygotsky's (1978) mediated action of higher mental functioning. Learning is mediated through the utilization of language in situated social practice. In CR, the teacher gave students a question to solve within their Zone of Proximal Development (ZPD). While within this zone, students were involved in a discussion where they engaged in the use of social speech. The students are at the same time internalized the knowledge they gain from discussion into their private speech in which learning happens and becomes crystallized in their higher mental function. In other words, he emphasized that high cognitive abilities such as rational argument and problem-solving skills are built through social interaction supported with the 'expert' supervision. The previous statement is in agreement with the idea that CR is based on Vygotsky's theory that cooperative learning and interaction may help less capable students progress cognitively with the help of their instructor or more skilled classmates since students exchange information via social contact (Dixon-Krauss, 1996). A recent study has investigated the influence of collaborative argumentation successfully enhancing students' language use and content quality in a writing argumentative essay (Jin et al., 2020). In terms of language acquisition, students can obtain new vocabulary which can level up to the existing language proficiency. These findings shed light that when one dialogic strategy

is used effectively in a discussion, it can spread to be used by other subjects, i.e writing activity, with increasing frequency.

Concerning the online learning environment, the implementation of CR does not seem to affect the students' performance during discussion. Though the online mode limits the researchers' ability to observe the students' behavior during discussions, the findings still suggest that dialogic discussion through CR can be an alternative to boost literacy and argumentation skills. The students were able to read texts, extract information, and use the information in a dialogue that constructs meaning in online situated practice. Online learning provides a more flexible space than conventional learning because it can bridge the time-place gap, and provide students with greater access and flexibility. Online learning can be effective if it is carried out using effective pedagogy, including structured and individual-centered learning mechanisms in an online communication environment (Liaw & Huang, 2013). Normally in the online mode, students are given enough time to prepare for their argument, so students can deliver more accurate and coherent (Kost, 2011) and thoughtful reasoning (Coffin & O'Halloran, 2009). Online CR is also beneficial to overcome communication barriers, such as anxiety and shyness, and to improve self-efficacy, especially for students at the tertiary level (Chen et al., 2018).

The above statement is also in line with the effect size measurement showing a large effect size for both skills as indicated by Cohen's d analysis. The size of the effect means that CR increased the literacy skills of the students by 19.2% of a standard deviation and increased the argumentation skills of the students by 99% of a standard deviation. Literacy can be defined as a process that involves the ability to read, write and speak language to extract, construct, and critique meaning through interaction and engagement with multimodal texts in specific social contexts (Frankel et al., 2016).

Additionally, argumentation skills can be understood as a structured form of discussion in which various speech acts, such as statements, questions, and explanations, are coordinated in such a way

within social norms (Deane & Song, 2014). The two skills are interrelated in which excellent argumentation skills are stemmed from high literacy skills to process and digest information. If we relate this topic to writing an argumentative essay, it comprises of mainly two pillars, such as powerful argument and effective language used to express their argument (Jin et al., 2020). One striking finding from the previous studies indicated that students who are actively involved in the CR activities write better essays compared to those who did not participate in the CR activities (Reznitskaya et al., 2009).

Many studies have concluded about the importance of argumentation skills in modern society. Quintana and Correnti (2018) mention that argumentation skills play a fundamental role in various communication practices which are a key component of modern society, it can be in the form of ordinary conversation, negotiation, debate, or deliberation. In the context of education, argumentation skills can be developed through discussion activities where students share, compare claims and evidence through argumentation and negotiation of statements in small or large groups (Oh & Kim, 2016).

As students involve in a competing arguments with each other, collaborative discussion is needed to resolve the uncertainty between different or controversial arguments (Memis & Akkas, 2020). Therefore, argumentation skills can be understood as a structured form of discussion in which various speech acts, such as statements, questions, and explanations, are coordinated in such a way within social norms (Deane & Song, 2014). A little is known about the argumentation skills of students in Indonesia, especially in the university setting. Most research in other contexts though still focus greatly on the written argumentation skills of the students. For instance, Luna et al. (2020) investigated argumentative writing skills in higher education in Spain involving sixty-eight undergraduates in a pre-post with a control group design. The participants received treatment with explicit instruction through video lectures and practice exercises with immediate feedback using open online resources (e.g., Moodle). The findings show that after the treatment, the participants'

writing improved significantly in their structure, the number of arguments for the against-position, and the degree of integration of the controversial perspectives.

Similarly, MacArthur, Jennings, and Philippakos (2018) examined linguistic features that predict quality argumentative writings of 252 college students in the U.S. After conducting structural equation modeling analysis, they found that referential cohesion ($p <$ .001) and lexical complexity ($p <$ .01) positively predicted quality on posttest essays while syntactic complexity ($p <$ .001) was negatively related to quality argumentative writing. This study indicates that instructional approach that focuses on referential cohension (i.e. the link between words across sentences) and lexical complexity (i.e. the use of unique words) may significantly improve the college students argumentation skills in writing.

The findings of the study do have several educational implications in the future. The findings of this study revealed that the students' argumentation and literacy skills increase over time. Teachers are suggested to use CR various teaching models to provide engaging classrooms by accommodating materials with different complexity that triggers students to give more thoughtful argumentation. Secondly, teachers could provide rich language input used to deliver argumentation so that students gradually become competent users of the language because language is the prior tool to respond and to argue (Duschl & Osborne, 2002; Yore & Treagust, 2006). Third, successful CR sessions required good planning Zhang et. al (2011) have given some tips for teachers before implementing CR, they are selecting a complex text with controversial issues which allow students to take a position and have a discussion about the topic. In delivering the controversial issues, teachers are suggested to give a 'big question' which can be answered in a 'yes' or 'no' which required higher cognitive functioning. Teachers should avoid 'how' questions. The next tip is teachers are suggested to comprehend the text completely and be ready for multiple responses from the students. Therefore, teachers should prepare arguments, reasons, and evidence to help students during the

CR session and evaluate students' argumentation. In addition, the findings of this research also contribute to the development of the body of knowledge in effective teaching methods to support literacy and argumentation skills.

Implementing CR to non-English speakers can be a demanding task for teachers. It is the teachers' responsibility to facilitate learning by creating an engaging and motivating classroom, moreover in online learning where direct interaction is limited. The problems that might arise from such condition is students' low motivation and low ability to speak in the target language. Interestingly, Zhang et al. (2011) have also provided ways to overcome these difficult situations by providing enough time for students to read the text and prepare for their argumentation. Regarding the students' lack of elaboration skills in delivering their response, as English Learners (EL) tend to give short responses and wait for feedback from their teachers, teachers may invite the students to evaluate their performance during the discussion and this will help them to be familiar and make a quick adjustment to CR activities. His next idea serves as the solution for students' difficulties to have a genuine and spontaneous discussion due to problems in understanding long text and limited English proficiency. Teachers facilitate students with responses logs in which students write their arguments so they are ready for CR sessions. This way increases students' participation in the discussion and reading comprehension.

CONCLUSION

The main objective of this research was to examine the effect of Collaborative Reasoning (CR) in improving undergraduate students' literacy and argumentation skills. A group of students who took the Communication and Gender course participated in this study. Using paired sample t-test, we found that scores of literacy and argumentation skills of the students after participating in CR were significantly greater than before participating in CR. These findings

indicate that CR as a dialogic approach to the discussion was statistically proven to be an effective tool for teaching.

However, we identified some limitations of the current study. First, due to the effective implementation of CR in this study being in an online environment, it was difficult to observe the students' behavior during the discussion, especially when they are divided into small groups. Future research might want to consider multiple observers with a similar focus of observation to overcome this flaw. Second, this study did not analyze the teacher and students' discourse during the discussion. What they say, how dialogue develops, and who say what were some points that future researchers might add up in the future. A comprehensive analysis of the discourse might inform the theory of schema used during the discussion. The schema then might be trained for students of similar contexts.

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