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Enhancing Communication Skills of Vocational High School Students through Cooperative Learning Type Group Investigation

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Abstract

Through the Cooperative Learning type Group Investigation (CL-GI), this study seeks to improve students' communication abilities. The beginning ability was taken into account as a moderator variable in this quasi-experimental investigation, which was carried out using a 2x2 factorial design. The study's participants were LVE 1 and 2 students in the 10th grade at Vocational High School (VHS) YPM 8 Sidoarjo. After performing several preliminary tests, such as normality and homogeneity tests, a two-way ANOVA was used to analyze the data. Numerous inferences can be made in light of the findings and debate. First off, kids who learnt with CL-GI had much better communication abilities than those who learned with DI. Second, students with strong initial abilities had much better communication skills than students with poor initial abilities. Thirdly, there was no discernible connection between the learning model and students' starting points in terms of communication abilities in the basics of automotive engineering.

Keywords*:* *Communication skills, Cooperative learning, Group investigation, Vocational education*

1. Introduction

Education plays a significant role in enhancing individual potential and is one of the key factors in fostering a nation's civilization in a sustainable manner. Despite various methods and approaches being used to create an ideal learning concept, it appears that educators are still experimenting to find the best methods for optimizing the learning process in the classroom. This is because the majority of teachers still heavily rely on a teacher-centered learning model (Nurjannah et al., 2017). In this context, it means that teachers have a highly dominant role and serve as the primary source of information in the learning process. All questions asked are answered directly by the teacher without student involvement (Ameliana, 2017). Learning with cooperative characteristics, such as cooperative learning, has not been given much attention in this regard. Le, Janssen, & Wubbels (2018) explain that the prevailing concept of learning, which focuses on the development of individual skills, tends to overlook the importance of social interaction. Ideally, effective learning should be interactive and interconnected, where integrated cooperation becomes the primary reference in developing the learning concept (Darling-Hammond et al., 2020).

In the 21st century, as we are currently in, every level of education, especially VHS, is increasingly expected to produce competent, intelligent, and job-ready graduates (Hermanto et al., 2019). Therefore, teachers are expected to equip their students with skills that can serve as a foundation for survival in the future (Amiruddin et al., 2018). Wagner (2008) revealed that there are at least seven essential survival skills that must be imparted to students. These abilities include: (1) critical thinking and problem-solving; (2) network collaboration and influence-based leadership; (3) adaptability and agility; (4) initiative and entrepreneurship; (5) effective oral and written communication; (6) information access and analysis; and (7) curiosity and imagination (Zhou, 2017). Through these seven skills, we can understand that collaboration or teamwork is one of the skills required of students. Additionally, it is equally important for

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teachers to train students to effectively communicate both orally and in writing.

Recognizing the need for certain essential skills to be imparted to students, it demands that teachers are capable of selecting teaching models that can support the development of these desired skills. In this regard, the Cooperative Learning model known as Group Investigation (CL-GI) is recommended. This model is considered ideal for implementation because it involves characteristics that require students to learn in groups through discussions conducted as part of an investigation (Ariyanto & Muslim, 2019). CL-GI was initially designed by Herbert Thelen and later refined by Sharan and colleagues at Tel-Aviv University (Ahsanah, 2016). This model may be the most complex and challenging to implement when compared to other types of cooperative models (Sangadji, 2016). In contrast to Jigsaw and STAD, GI tends to involve students in planning the learning topic and the methods to be used in the investigation (Arinda et al., 2019). Therefore, each student is not only responsible for themselves but also for their fellow group members.

Teachers who use GI typically divide the class into heterogeneous groups with a membership ranging from five to six students (Arends, 2012). The choice of groups, however, might occasionally also be made based on the students' preferences for particular subjects. In order to utilize the GI cooperative learning model, teachers should follow six steps that Slavin (2006) outlines: topic selection; cooperative planning; implementation; analysis and synthesis; presenting of outcomes; and evaluation (Achmad et al., 2018). Teachers can utilize this strategy to help pupils improve their communication skills in addition to encouraging collaboration or teamwork. The ability to communicate effectively is crucial because it is highly valued in many occupations (Mahajan, 2015; Seetha, 2014). A workforce equipped with strong communication skills will undoubtedly find it easier to accomplish tasks assigned to them (OECD/ILO, 2017; Suarta et al., 2017).

In the context of learning, the cooperative model of GI provides students with opportunities to develop their communication skills. In this case, these skills can be cultivated when students actively engage in discussions to solve the problems that each group faces. Teachers also play a role when students begin their discussions by posing scientifically oriented questions. In this process, students are directed to seek and discover scientific answers based on the questions posed. Trilling & Fadel (2009) in their book, outline five criteria or indicators for assessing communication skills. These criteria include: (1) articulating thoughts and ideas effectively; (2) listening to interpret meaning; (3) communicating for various purposes; (4) using media and technology effectively in communication; and (5) effective communication in diverse (multilingual) environments. Ramachandiran, Mahmud, & Jomhari (2016) based on their research, suggest at least three indicators that can serve as a reference for assessing communication skills. These three indicators encompass: (1) effective communication; (2) the use of media and technology in communication; and (3) the effectiveness of communication in diverse environments.

In contrast to the two previous studies, Kelley, Knowles, Han, & Sung (2019) formulated 10 indicators for assessing communication skills based on their research findings. These 10 indicators include: (1) using appropriate media to enhance understanding; (2) adapting to the right communication style; (3) speaking clearly and professionally; (4) delivering clear and engaging introductions and conclusions; (5) presenting all information clearly, concisely, and logically; (6) conveying alternative perspectives clearly; (7) effectively organizing information; (8) using appropriate and effective body language; (9) providing clear and concise answers to questions. From the various indicators presented, it can be concluded that to measure communication skills, at least five indicators should be considered. These five indicators encompass: (1) communicating clearly, concisely, and logically; (2) using appropriate technology or media; (3) employing the right communication style and body language; (4) communicating effectively in multilingual environments.

Communication skills are crucial for students because they are required to convey their ideas and thoughts during the learning process. Additionally, students are trained to speak in front of the class with the aim of expressing their personal opinions without emotion, anger, or rudeness (Derlina & Hasanah, 2017a). Numerous relevant studies have shown the effectiveness of employing cooperative learning approaches to improve students' communication abilities in general. According to M. Al-Tamimi & Attamimi (2014), the introduction of cooperative learning considerably improved the speaking abilities and attitudes of the students. Therefore, suggest that all English teachers should be able to use cooperative learning. Cooperative learning, according to El-Sayed & Mousa (2015) was also associated with improved achievement in school, improved student relationships, and improved psychological adjustment. Additionally, it can be said that cooperative learning is highly beneficial in developing effective communication skills in nursing

students and successfully practicing with psychotic patients.

Furthermore, Mohamad et al. (2015) showed that structured and unstructured patterns of student interaction were revealed by the findings of quantitative and qualitative analysis of log data. Students' attention to using interaction tools and the caliber of the generated discussions were similarly influenced by the variations in interaction patterns. The ramifications of this research's findings can help students become better communicators. Meanwhile, Marfuah (2017) found that when the learning process was spread out over three cycles, communication abilities significantly improved. The results of students' learning have also improved. The Jigsaw cooperative learning method can therefore be used to improve students' communication abilities. In accordance with earlier studies, Dendup & Onthanee (2020) came to the same conclusion in their scholarly article that cooperative learning can be used as a successful teaching strategy to improve English Communicative Abilities (ECA) in the context of English as a Second Language (ESL), particularly in the context of Bhutanese schools.

Three hypotheses are put out in accordance with the underlying knowledge and pertinent study findings. First, there is a difference in communication skills between students who learn using CL-GI and DI. Second, there is a difference in communication skills between students with high initial abilities and those with low initial abilities. Third, there is an interaction between the learning model and initial abilities concerning communication skills.

2. Method

The experimental and control groups were not chosen at random when the 2x2 factorial design was utilized in this investigation. However, pre- and post-tests were administered to both groups (Creswell, 2009). Figure 1 illustrates the experimental plan used in this study to aid with comprehension.

Experiment	O_{1A}	X_1	X_1	O_{2A}
		-	X_2	O_{2B}
Control	O_{1A}	X_2	Y_1	O_{2C}
		-	Y_2	O_{2D}

Figure 1. 2x2 Factorial Design
Adopted: Tuckman & Harper (2012)

$O_{1A,1B}$ represent the pre-test results. $O_{2A,\ 2B,\ 2C,\ 2D}$ represent communication skills. X_1 dan X_2 indicate treatment in the experimental and control groups, respectively. Meanwhile, Y_1 dan Y_1 represent students' initial abilities. Based on the experimental design outlined above, the research analysis design is presented in Table 1.

Table 1. Research Analysis Design

Learning Model	Initial Ability	
	High (Ia_{T1})	Low (Ia_{T2})
CL-GI (Lm_1)	Lm_1Ia_1	Lm_2Ia_1
DI (Lm_2)	Lm_1Ia_2	Lm_2Ia_2

In this study, the communication skills of students who learned using the CL-GI model in the high initial ability group (Lm1Ia1) and in the low initial ability group (Lm1Ia2) were observed. Additionally, the communication skills of students who learned using the DI model were also analyzed, both in the high initial ability group (Lm2Ia1) and in the low initial ability group (Lm2Ia2). This research was conducted at VHS YPM 8 Sidoarjo. The study's subjects were students from 10th-grade students from LVE 1 and 2 classes, who were enrolled in the basic automotive engineering course. Class LVE 1 served as the experimental group, learning through CL-GI, while class LVE 2 served as the control group, learning through DI. It is quasi-experimental in this study to separate students according to their starting levels of ability. Before the research activities started, a test was given to students to ascertain their baseline skills. Students ranking from 1 to 20 were categorized as having high initial ability, while students ranking from 21 to 40 were categorized as having low initial ability. After performing necessary checks like normality and homogeneity tests, a two-way ANOVA was used as the data analysis technique.

3. Results and Discussion

a. Description of the Data

Calculations and data analysis reveal that students in the experimental group had stronger average communication skills than those in the control group. Table 2 contains the calculations' outcomes in more detail. From the data in Table 2, it is evident that the experimental group has a higher mean value, which is 81.4, whereas the control group's mean value is lower at 63.3. The median appears to be almost the same as the mean, with the experimental group at 82.5 and the control group at 65. Additionally, the mode or the most frequently occurring value can be observed. In the experimental group, the most frequently occurring score is 68, while in the control group, it is 65. Next, the

standard deviation for the experimental group is 10.68547, and for the control group, it is 10.57045. The variance for the experimental group is 114.179, while for the control group, it is 111.734. This indicates that the experimental and control groups have relatively similar distributions.

Table 2. Description of student communication skills data

Statistical Measure	Experiment	Control
Mean	81.4000	63.3000
Std. Error of Mean	1.95089	1.92989
Median	82.5000	65.0000
Mode	68.00	65.00
Std. Deviation	10.68547	10.57045
Variance	114.179	111.734
Skewness	0.131	-0.180
Std. Error of Skewness	0.427	0.427
Kurtosis	-1.106	-0.962
Std. Error of Kurtosis	0.833	0.833
Range	35.00	36.00
Minimum	65.00	45.00
Maximum	100.00	81.00
Sum	2442.00	1899.00

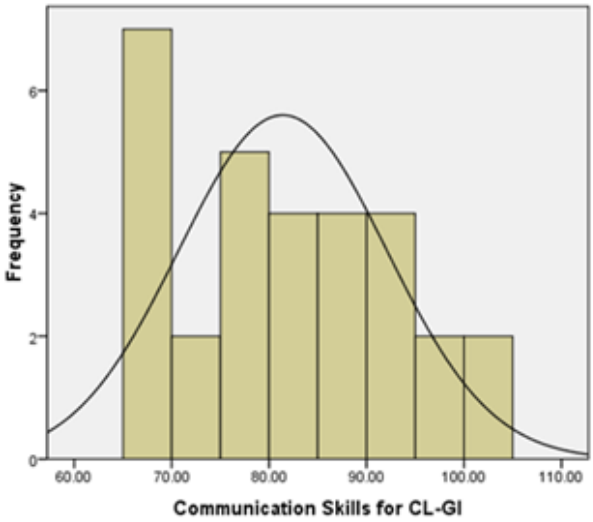

Figure 2. Communication Skills Histogram for CL-GI

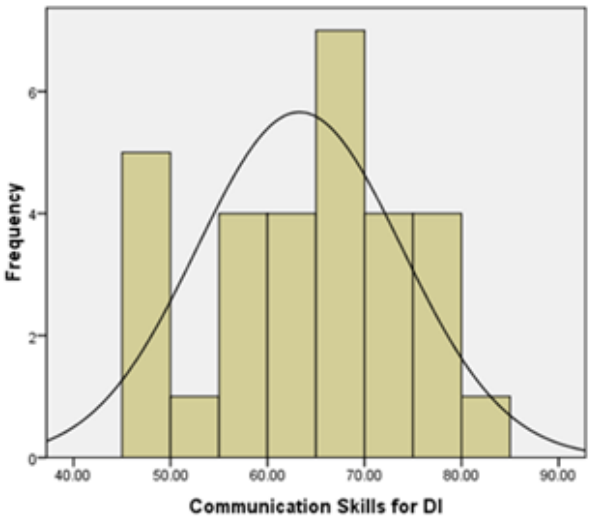

Figure 3. Communication Skills Histogram for DI

The skewness for the experimental group is 0.131, which means that the data curve is slightly skewed to the right (positively skewed). In contrast, the skewness for the control group is -0.180, indicating that the data curve is slightly skewed to the left (negatively skewed). The standard error of skewness for both the experimental and control groups is the same, at 0.427. These results show that the comparison between skewness and the standard error of skewness for each group falls within the range of $-2<x<2$. The kurtosis obtained for the experimental group is -1.106, while for the control group, it is -0.962. These results indicate that the data distribution is less than 0.263, categorizing it as platykurtic, meaning it has thinner tails and is less peaked. This result can also be observed through the histogram distribution of data for the experimental and control groups, as shown in Figures 2 and 3.

b. Preliminary Analysis Assumptions

The data from the research was subjected to preliminary tests before proceeding to hypothesis analysis. Therefore, in this task, a test for normality of distribution and a test for homogeneity of variance were conducted. To ascertain whether the data under analysis will follow a normal distribution or not, the normality of distribution test was run. The normality test in this study

was conducted using the Kolmogorov-Smirnov test, with a significance level of 0.05. Table 3 displays the findings of the normalcy test.

Table 3. Results of Normality Test for Student Communication Skills

Group	Test Statistic (Z)	Sig. (Probability)
Experimental	0.703	0.706
Control	0.608	0.854

According to the information in Table 3, the Kolmogorov-Smirnov test was used to determine the normalcy of the communication abilities of students in both the experimental and control groups at a significance level of 0.05. The Z-value for the experimental group was 0.703, and the significance value (sig.) was 0.7006. On the other hand, the Z-value and significance value (sig.) for the control group, respectively, were 0.608 and 0.854. The null hypothesis (H0) is accepted since both the significance values for the experimental and control groups are more than 0.05 (0.706 > 0.05 and 0.854 > 0.05), indicating that the data have a normal distribution. The homogeneity of variance test was used to determine whether population variances were equal. The Levene's test was employed in this investigation with a significance threshold of 0.05 for the homogeneity of variance test. The homogeneity test was conducted according to the research questions posed. The results of the homogeneity of variance tests can be seen in Tables 4.

Table 4. Homogeneity Test of Communication Skills

Group	Levene Statistic	df1	df2	Sig. (Probability)
CL-GI vs DI	0.100	1	58	0.753
High vs Low	0.106	1	58	0.746
Interaction	0.541	3	56	0.656

Table 4 displays the outcomes of the homogeneity of variance test for the first research question. Levene's statistic value is 0.100, df1 is 1, df2 is 58, and the significance value (sig.) is 0.753 are all indicated in this table. The null hypothesis (H0) is accepted since the significance value (sig.) is more than 0.05 (0.753 > 0.05), indicating that the communication abilities between students who learned via CL-GI and DI have homogenous variances. Table 4 also contains the outcomes of the homogeneity of variance test for the second research question. The significance value (sig.) in this table is 0.746, the Levene's statistic value is 0.106, the df1 and df2 values are 1 and 58, respectively. Since the significance level (sig.) is higher than 0.05 (0.746 > 0.05), it is inferred that the null hypothesis (H0) is accepted and that there are no differences in communication abilities between students with high and low initial abilities. Finally, Table 4 displays the outcomes of the homogeneity of variance test for the third research question. The significance value (sig.) is 0.656, the df1 is 3, and the df2 is 56 in this table. The F-value is 0.541. The null hypothesis (H0), which states that the interaction between the learning model and the initial ability in regard to communication skills presents homogenous variances, is accepted because the significance value (sig.) is more than 0.05 (0.656 > 0.05).

Hypothesis Testing

Table 5. Results of Two-way ANOVA Testing

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	9618.317	3	3206.106	97.190	0.000
Intercept	314071.350	1	314071.350	9.521E3	0.000
Models	4914.150	1	4914.150	148.967	0.000
Initial Ability	4699.350	1	4699.350	142.456	0.000
Model * Initial Ability	4.817	1	4.817	0.146	0.704
Error	1847.333	56	32.988		
Total	325537.000	60			
Corrected Total	11465.650	59			

The research data is recognized to come from a normally distributed dataset and show homogeneity of variance based on the outcomes of the completed precondition tests. We can now move forward with two-way ANOVA hypothesis testing because two requirements for analysis have been satisfied. For hypothesis testing, a significance level of 0.05 is employed. The significance value (sig.) must be more than 0.05 (sig. > 0.05) in order for the hypothesis to be accepted, or H0 must be accepted instead. Table 5

provides more information on the results of hypothesis testing.

The results of the two-way ANOVA for testing the first hypothesis using the data in Table 5 produced an F-value of 148.967 and a sig. value of 0.000 at df (degrees of freedom) equal to 1. Given that the sig. value is less than 0.05 (0.000), H1 is assumed to be acceptable. This indicates that students who learned with CL-GI and those who learned with DI had extremely different communication skills. Table 2 statistics, which show that the experimental group, which learned using CL-GI, has a higher mean than the control group, which learned using DI, supports this. As a result, this finding is consistent with the first hypothesis put forth, which suggests students learning with CL-GI and DI have different communication skills. The results of this research are in line with the study conducted by Derlina & Hasanah (2017b), which suggests that, in general, a student's lack of success in a particular field cannot solely be measured based on their level of intelligence. It can also be measured based on their character traits, including their ability to interact, commonly referred to as communication skills. Additionally, this research aligns with the findings of Permata & Mustadi (2019) demonstrating the effectiveness of CL-GI in improving written communication skills. This is likely because students feel more comfortable expressing their ideas, opinions, and thoughts about the materials they are learning. Astuti et al. (2019) discovered that the use of ICT-based CL-GI had a favorable effect on students' communication skills. This is demonstrated by the fact that the experimental class, which used CL-GI ICT to learn, achieved higher average post-test scores than the control class, which used non-ICT CL-GI to learn, particularly around electrolyte and non-electrolyte solutions.

With a df of 1, the second test produced an F value of 142.456 and a significance value of 0.000. Given that H1 is accepted, the significance value is less than 0.05 (0.000). This indicates that students with high initial abilities and those with low initial abilities have substantially different communication skills. The study by Latif & Akib (2016) reveals that students with good initial abilities tend to understand the information more rapidly during the learning process. This research supports that finding. The fact that pupils with strong initial abilities find it simpler to recognize mathematical concepts lends weight to this. They can then apply these ideas to the knowledge they already have to solve the difficulties that have been presented. In line with this research, Nurmantoro (2017) through his research also illustrates that initial ability has a direct influence on mathematical communication skills. Initial ability serves as an early indicator of a student's readiness to receive the upcoming material. Students who start out with higher initial abilities likely to have better learning outcomes than those who start out with lower initial abilities (Purwaningrum & Sumardi, 2016). Additionally, this research provides evidence that supports the findings of Sufena et al. (2018), who claim that students' initial mathematical abilities have a significant impact on their communication skills.

The third hypothesis investigated if the learning model and the innate capacity for communication skills interact. For the third hypothesis, the two-way ANOVA results produced a F value of 0.146 and a significance value of 0.704 at df of 1. Because the significance value (0.704) is higher than 0.05, it can be said that H0 is accepted. In the basics of automotive engineering, this indicates that there is no meaningful interaction between the learning model and initial ability on students' communication abilities. Furthermore, as shown in Figure 4, these findings imply that the learning model and initial ability have no discernible interactions with students' communication skills in the basic automotive engineering. The findings of this study are consistent with those of Derlina & Hasanah (2017b) study, which found that the cooperative learning model GI had an impact on learning outcomes. However, the development of students' interpersonal communication skills could not be maximized. This is because the relatively larger number of students in one class led to ineffective time management and implementation of learning. This finding is consistent with Le et al. (2018) which suggests that communication problems often arise due to students' limited collaborative abilities, hindering active participation and contribution in group work. Furthermore, Namaziandost, Namaziandost et al. (2019) also explained that class size is one of the constraints in implementing CL-GI. If there are a large number of students in one class, it reduces the opportunity for active communication. Given the findings of this research, the implementation of CL-GI should ideally have a positive impact on students' communication skills. Mehta & Kulshrestha (2014) emphasized that communication skills are crucial for students to meet the demands and challenges of the future. Beyond knowledge, communication skills, leadership qualities, critical thinking, and listening skills are necessary to achieve excellence in one's career.

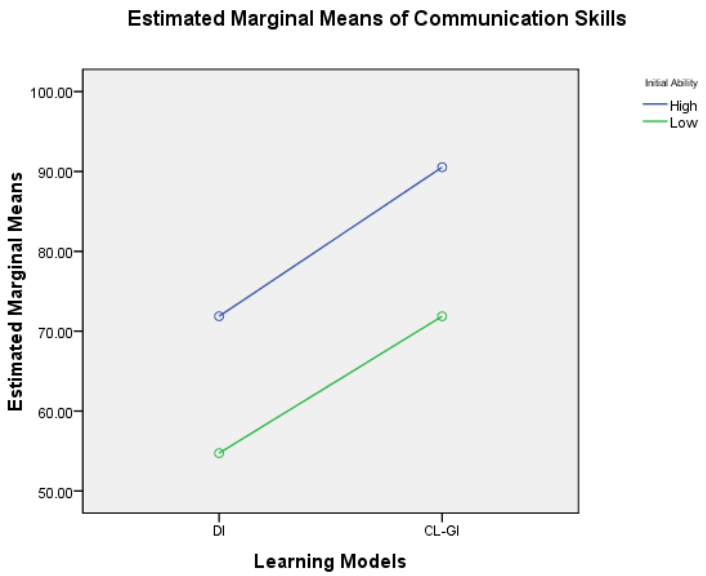

Figure 4. Interaction Between Learning Model and Initial Abilities on Students' Communication Skills

4. Conclusion

Based on the results of this research, it can be concluded that there is a highly significant difference in students' communication skills between the group using CL-GI and the group using DI model. This is indicated by a very low significance value (sig. = 0.000), which suggests that the difference is highly significant. Additionally, the test results with a very low significance value (sig. = 0.000) show a highly significant difference in communication skills between students with high initial abilities and those with low initial abilities. With a significance level greater than 0.05 (sig. = 0.704), there is no significant interaction between the learning model and the students' initial abilities on communication skills. This means that the instructional model and students' initial abilities do not have a significantly interactive influence on students' communication skills in the field of basic automotive engineering course.

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