A Study on the Improvement of Self-Directed Learning: The Jigsaw Model in the Digital Convergence Age

Young-Hee Jang[a], [a]Professor, Department of General Education, Namseoul University, 91, Daehak-ro, Seonghwan-eup, Seobuk-gu, Cheonan, Chungcheongnam-do, 31020, Korea, Email: [a]hyejo@nsu.ac.kr

Background/Objectives: The purpose of this study was to investigate the effect of cooperative learning methods on comprehensive thinking ability, interpersonal relationship and communication competence in communication related courses offered to engineering students. **Methods/Statistical analysis**: This study includes thirty engineering students who were taking a "writing" class, which is a compulsory liberal arts course. The students were divided into six small groups and two Jigsaw classes were conducted during the second half of the semester, from after the midterm exam to before the final exam. Analysis was performed on responses from 28 participants, excluding insincere responses from two participants. Data was analysed using independent t-test. **Findings**: The effects of cooperative learning can be summarized as follows. First, students' learning motivation was naturally induced by their increased interest and satisfaction. This teaching method induced cooperation through interdependence, thus creating close peer relationships, and encouraged all members to actively participate in the process of solving the task with responsibility. Second, as members acquire the knowledge necessary to solve problems through interactions with other members, they become more focused on class, resulting in increased satisfaction. Ultimately, this student-centered learning attitude improved learning achievement. Third, students developed confidence in verbal expression and presentation skills by engaging in presentation and discussion. Fourth, students were able to broaden their thinking as they shared a variety of information with many people, and thus they acquired the ability to write more substantially and illustratively without difficulty. **Improvements/Applications**: The significance of the present study lies in identifying significant effects of cooperative

learning on students' learning attitude and academic achievement in relation to communication area subjects.

Key words: *Self-Directed Learning, Jigsaw Model, Cooperative Learning, Self-directed Learning, Academic Achievement, Communication Competence.*

Introduction

With the recent arrival of the fourth industrial revolution, which is represented by artificial intelligence, Internet of Things, and big data, the industrial world needs talents who can cope with these changes. In the age of the fourth industrial revolution, various technologies are being developed, converging with each other, and because the ripple effect is incomparably faster than the past, absorbing continuously produced knowledge through education has fundamental limitations. Accordingly, universities should prepare students to play the role of leaders in our society by fostering them as talents with professionalism and personality who can not only solve problems creatively by converging knowledge they have learned, but also collaborate through communication and empathic ability. The core of university education today is cultivating intellectuals with creative problem solving and communication ability through the consilience of knowledge, character and quality as a citizen of the world for the 21st century, in addition to education in basic humanities disciplines to foster global leaders.

The purpose of this study was to investigate the effect of cooperative learning methods on comprehensive thinking ability, interpersonal relationship and communication competence in communication related courses offered to engineering students. Cooperative learning (Jigsaw) model is a teaching method that can increase academic motivation and achievement while reducing the burden of writing for students who face difficulties with writing. It is possible to make students feel the joy of true learning through collaborative work and cooperation rather than competition among students (Benson, 1997); (Kagan, 1994).

Accordingly, the present study examined the improvement in self-directed learning ability using the cooperative learning method of Jigsaw in the age of digital convergence. Jigsaw requires that learners voluntarily participate in class, conduct self-directed study, and complete their assignments. Jigsaw can increase the quality of classes and meet the demands of learners by overcoming the limitations of traditional teaching methods. Hence, the present study examined the influence of this alternative teaching method on the learning attitude and academic achievement of students.

Theoretical Background and Hypothesis
Jigsaw Cooperative Learning

Cooperative learning is a suitable teaching method for nurturing talent for the era of the fourth industrial revolution and an effective learning method to promote students' autonomy and active participation in class. Cooperative learning is a method originally used in sociology in which members of the same group help each other study the same learning tasks (Suh, 2009). Members gain voluntary enthusiasm for problem solving through the shared nature of the task and form friendly relationships by communicating and sharing with members in the process of solving problems through cooperation. Cohen (1994) also defined small group cooperative learning as a teaching method in which a common outcome is derived by all learners actively participating in a common task clearly assigned to the small group to which they belong (Cohen, 1994). For research data, a survey was conducted on whether to have the experience of Jigsaw cooperative learning and students' academic achievement, writing improvement, communication competence, and self-directed participation in such classes after completing the traditional method of professor centered classes in the first half of the semester (Brown, 2001).

Unlike group learning, the goal of cooperative learning is structured so that learners pay attention not only to their own achievement but also to all group members. Accordingly, group members have to rely on each other and maintain good relationships to maximize learning achievement. In group learning, however, learners mostly pay attention to completing the assigned task. In addition, because learners with high learning ability are likely to be leaders in group learning, other members are either passive or tend not to be active due to the lack of personal responsibility. In contrast, cooperative learning has a structure that is intentionally designed to improve problems in the learning environment caused by teacher-centered learning—which emphasizes competition among students—and to encourage students to cooperate to complete assignments. In this learning method, students become co-operators rather than competitors while maintaining close relationships among themselves (Aronson et al., 1978). Thus, positive educational effects can be expected from Jigsaw in that it induces self-directed learning by creating a friendly learning environment among members through smooth communication among learners. Learners, however, can follow the mistakes of a specific learner in the small group without thinking, and participation can be low in the case of learners with somewhat low learning ability. Nonetheless, Jigsaw has a number of positive effects in general. Learners tend to form friendly peer relationships as they care and listen to each other, and in comparison, to the competitive learning structure, the negative aspects of competition reduce through the improvement of academic achievement and self-esteem. Further, the cognitive learning effects of these learners were greater than students who took traditional classes. This model

also improved problem solving ability by enabling the understanding of complex learning material through cooperation among members (Dat and Ramon, 2012); (Suh, 2009).

Hypothesis

Hypothesis 1: Academic achievement will be higher after cooperative learning than before cooperative learning.

Hypothesis 2: Writing competence will be higher after cooperative learning than before cooperative learning.

Hypothesis 3: Learning attitude will be better after cooperative learning than before cooperative learning.

Hypothesis 4: Communicative competence will improve after cooperative learning than before cooperative learning.

Hypothesis 5: Self-directed learning competence will improve after cooperative learning than before cooperative learning.

Research Method
Participants

This study includes thirty engineering students who were taking a "writing" class, which is a compulsory liberal arts course. Students received traditional professor-centered classes on basic writing theories for seven weeks from the first week of the semester to before the midterm exam. Following this, the students were divided into six small groups and two Jigsaw classes were conducted during the second half of the semester, from after the midterm exam to before the final exam. Analysis was performed on responses from 28 participants, excluding insincere responses from two participants.

Research Procedures

Basic writing theories were taught in traditional teacher-centered classes for seven weeks, from the first week of the semester to before the midterm exam. After classes, a survey was conducted on lecture-based classes regarding the academic achievement, writing improvement, learning attitude, communication competence, and self-directed learning of students. After the midterm exam, from the 9th week, classes were conducted using the Jigsaw model, with students divided into small groups.

The professor sufficiently explained to students the characteristics and methods of the Jigsaw and also assignments, learning objectives, and the main contents of learning. Groups were composed as heterogeneously as possible. Members within the same group were given different assignments. Each subject was asked to prepare and review learning materials

related to the assignment and write the first draft. Each member of the small group engaged in discussions with the expert group, freely exchanging opinions about the material provided for the cooperative learning assignment. Through this process, the outcome of the entire small group was derived. This is an important element for effectively managing the class; it determines the academic achievement of each individual which is reflected in the class participation score. After the Jigsaw, learning attitude, and academic achievement before and after the Jigsaw were compared by conducting a survey again.

The proposed procedure is as follows. Overview of Cooperative Learning -> Population Composition -> Presentation -> Collecting Data -> Preparing Individuals by Individuals -> Completing the results of small group after discussion and conversation free from experts. Rewriting individual manuscripts -> Peer review by presenting in the population -> Submitting individual results.

Collaborative learning is a way to increase learning motivation and achievement while reducing burdens on writing for students who are burdened with writing and are in need. We divide professional tasks by individual and subdivide roles and learn in the form of division of labour. In order to understand the whole contents, we offer tasks that can be divided into the number of members so that they cannot learn without help from each other. It is possible to share the thoughts of students through collaborative work among students and collect their thoughts so that they can feel the pleasure of true learning through cooperation rather than competition. The more the problem is closely related to the students' real life, the more social issues they are interested in, the more likely it is that they are interested and interested in students. This is because students can actively participate in learning through a solution to a given problem or by presenting and explaining their position. Considering these aspects, the challenges presented are as follows.

The challenge: the elderly who are unable to meet natural deaths at the border of life and death, the young people who break their lives by their own difficulties, those who easily think of the weaker ones, I live at the same time. The social atmosphere that places priority on competition and materials is causing the loss of my life and the reverence for the life of others. This appears to be a sense of responsibility for their lives or a weakening of community consciousness. There is a need to create a culture of respect for life in order to instil positive values for life and increase understanding of the dignity of life. To this end, education for respect for life and personality education should be urgently made in schools and society.

It is divided into social phenomena such as youth suicide, elderly suicide, child abuse, public and public life, and it is investigated and shared with expert group. Basic Course in assignment Learning model is shown in table 1.

Table 1: Basic Course in Assignment Learning Model

Process	Major Activities
Team Composition	Form 4-6 heterogeneous groups (3-7 possible).
Home Team	Students are divided into individual tasks and are divided into roles and learned in the form of division of labor. In order to understand the whole contents, we provide learning materials divided by the number of members so that they cannot learn without help from each other.
Exert Team	Students will be grouped with members of other groups who have been assigned the same learning materials and will be trained. You should be sure to return to the original population and tell how to deliver the core content, while speaking your opinion and listening to others.
Home Team Reconvene	It teaches through the presentation so that the members of the population can understand the contents learned by the expert group.
Arrangement	Respond to the entire query and let it organize
Evaluation	Evaluate by individual and group.

Data Collection

A survey was conducted on whether to implement Jigsaw cooperative learning and promote students' academic achievement, writing, communication competence, and self-directed participation in such classes after completing the traditional method of professor-centered classes in the first half of the semester. The survey was conducted again after Jigsaw was completed, and the survey results were used to compare students' learning attitude and learning achievement before and after the Jigsaw. After the Jigsaw, a survey was conducted on students' responses to cooperative learning, how their writing was changed by cooperative learning, and whether writing competence was improved.

Results

To determine differences in academic achievement, writing improvement, learning attitude, communication competence, and self-directed learning before and after the Jigsaw, data were analysed using independent t-test. The results are presented in Table 2.

Table 2: Mean and Std. Deviation

Dependent Variable	Jigsaw	N	Mean	Std.Deviation	t-Value
Academic achievement	Before	28	3.03	.83	6.09**
	After		4.17	.54	
Writing competence	Before	28	3.17	.81	3.75**
	After		3.96	.74	
Learning attitude	Before	28	2.94	.78	7.09**
	After		4.17	.47	
Communication competence	Before	28	2.87	.88	7.14**
	After		4.30	.56	
Self-directed learning	Before	28	3.00	.78	7.60**
	After		4.41	.59	

Note : Degree of Freedom = 54, **$p<.01$

Independent t-tests were performed, in which before and after the Jigsaw were taken as the independent variables; academic achievement, writing improvement, learning attitude, communication competence and self-directed learning were taken as the dependent variables to determine differences in academic achievement, writing improvement, learning attitude, communication competence, and self-directed learning before and after the Jigsaw.

Academic achievement before and after the Jigsaw was significantly different by 99%(t=6.09, df=54, $p<.01$). The result showed that academic achievement was higher after the Jigsaw than before, which supports Hypothesis 1.

Writing improvement was significantly different by 99% (t=3.75, df=54, $p<.01$). The result showed that Jigsaw had a positive effect on writing improvement, which supports Hypothesis 2.
Learning attitude was significantly different by 99% (t=7.09, df=54, $p<.01$). The result showed that Jigsaw had a positive effect on the improvement of learning attitude, which supports Hypothesis 3.

Communication competence was also significantly different by 99% (t=7.14, df=54, $p<.01$). The result showed that Jigsaw had a positive effect on the improvement of communication competence, which supports Hypothesis 4.

A significant difference of 99% was found in self-directed learning as well (t=7.60, df=54, $p<.01$). It showed that Jigsaw helped to improve self-directed learning. Consequently, Hypothesis 5 was also supported. The results are shown in Figure 1.

Figure 1. Before/ After on Jigsaw
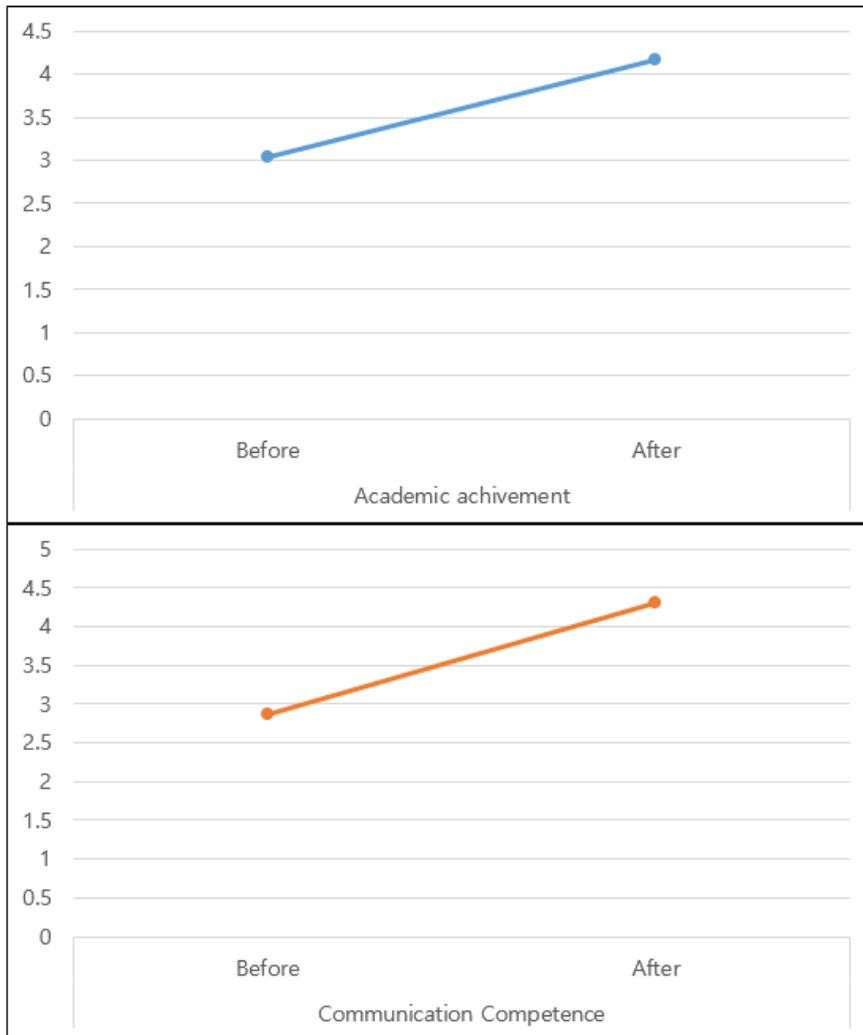
Conclusion

The present study proposed cooperative learning for communication courses as a teaching-learning method that can increase the quality of learning and learners' active participation in class. It paid attention to learners' responses to the survey conducted before and after the application of cooperative learning. The effects of cooperative learning can be summarized as follows (Slavin, 1990); (Slavin, 1991).

First, students' learning motivation was naturally induced by their increased interest and satisfaction. This teaching method induced cooperation through interdependence, thus creating close peer relationships, and encouraged all members to actively participate in the process of solving the task with responsibility.

Second, as members acquire the knowledge necessary to solve problems through interactions with other members, they become more focused on class, resulting in increased satisfaction. Ultimately, this student-centered learning attitude improved learning achievement.

Third, students developed confidence in verbal expression and presentation skills by engaging in presentation and discussion.

Fourth, students were able to broaden their thinking as they shared a variety of information with many people, and thus they acquired the ability to write more substantially and illustratively without difficulty.

The significance of the present study lies in identifying significant effects of cooperative learning on students' learning attitude and academic achievement in relation to communication area subjects. The findings of the present study indicate that cooperative learning can be considered as a useful alternative teaching method that can increase the quality of class and meet the demands of learners by overcoming the limitations of lecture-based traditional teaching method in university education in the future.

Acknowledgment

REFERENCES

Aronson, E., Blaney, N., Silkes, J., Stephan, G. & Snapp, M. (1978). The Jigsaw classroom. Beverly Hills, CA: Sage Pub.

Benson, P. (1997). Teaching and Researching Autonomy in Language Learning. London: Longman Press.

Brown, R. (2001). Group Processes: Dynamics within and between the groups. Wiley-Blackwell.

Cohen, ElG. (1994). Restructuring the classroom: Conditions for productive small group. Review of Educational Research, 64(1):1-35.

Dat, VT. & Ramon, L. (2012). The Effects of Jigsaw learning on students' attitudes in a Vietnamese higher education classroom. International Journal of Higher Education, 1(2): 9-20.

Kagan, S. (1994). Cooperative learning, San clemente, CA: Kagan Publishing.

Slavin, RE. (1990). Cooperative learning: theory, research and practice, Boston: Allyn and Bacon.

Slavin, RE. (1991). Synthesis of research on cooperative learning. Educational Le- Adership, 48(5):71-82.

Suh, JS. (2009). Reading concepts in cooperative work by EFL college students. English Teaching, 64(2):151-171.

Suh, JS. (2009). Reading concepts in cooperative work by EFL college students. English Teaching, 64(2):151-171.