

Neurocognitive Viewpoint In The Correlation Of Jigsaw Method, Gender, And Self-Efficacy

Lufiana Harnany Utami, I Nyoman Sudana Degeng, Gunadi Harry Sulisty, Tutut Chusniyah, Ambar Sulianti

Abstract: This research aimed to analyze the effect of Jigsaw cooperative learning methods on four dimensions of self-efficacy from a neurocognitive perspective and the difference between male and female students. Those dimensions are self-efficacy in social resources, self-efficacy for academic achievement, self-efficacy for self-regulated learning and self-assertive efficacy. This research employed a mixed method use Sequential Explanatory study with a sample of 280 high school students. In phase 1, quantitative data was collected using a self-efficacy questionnaire that was adopted from the Self-Efficacy Scale developed by Bandura, and through testing validity and reliability, consisting of 26 questions. The statistic used to analyze the differences in the four dimensions of self-efficacy in male and female students is the MANOVA analysis followed by post hoc Bonferroni test. In phase 2, observations and interviews were conducted with students to obtain qualitative data of their learning experiences using the Jigsaw method. The last step is to triangulate data to discuss the problems in this study. The results of this study showed that female students in the jigsaw method group had high self-efficacy in enlisting social resources and self-assertive efficacy. The Jigsaw method has no effect on male and female self-efficacy for academic achievement. The dimensions of male self-efficacy for self-regulated learning in the conventional group were higher than in the Jigsaw group. Perceptions, motivations, and social cohesion abilities of students affect the dimensions of self-efficacy in the jigsaw learning method.

Index Terms: Gender, Jigsaw method, neurocognitive, self-efficacy

1. INTRODUCTION

ENGLISH in Indonesia is a foreign language that must be studied at school. There are various problems in studying English Foreign Language (EFL) which are reported from various studies. Students face many difficulties when they learn a foreign language because of their senses receive some-thing foreign [1]. Students come from populations with varied mother tongue so that the student thinks of difficulty [2]. Students feel troubled in learning foreign languages because of the lack of practice. The feelings of helplessness experienced by students so that it feels impossible to master a foreign language [3]. Students feel bored because the teacher often repeats words in learning foreign languages [4]. To overcome this difficulty, some teachers use different learning methods with the lecture method with the help of conventional media. One of the innovations in the learning method used is cooperative learning. Cooperative learning is structured and systematic learning where small groups work together to achieve common goals [5]. This learning method is implemented in the form of formal, informal, and basic cooperative. What is usually done in schools is a formal method with one of the methods, namely the Jigsaw method. Formal cooperative learning is a type of structured group work in groups assigned to 3-4 students who have been analyzed and get the initial score by the teacher. The selected students will direct other students in small groups with the most effective way [6]. The Jigsaw learning method is based on cooperation, mutual support in completing the task in small groups to achieve shared learning goals [7],[8],[9]. Mengduo and Xiaoling (2010) describe that jigsaw is one method of cooperative learning that re-quires all members to create the final product [10]. Like the jigsaw puzzle part, in this case, is the part of the material that is shared with each student

becomes an important part of the final product and an understanding of the material intact. If each part of the material that is in students is important, then each student's position is as important as that so that it will make the jigsaw strategy effective. Research on social cognitive tasks in adults and adolescents shows that women tend to do social cognition tasks better than men. The young men experience hyperventilation higher than females [16]. Research in China shows that the teenage males showed physical activity self-efficacy higher than females [17].

Research on the learning process does not give immediate results because it is often based on the interpretation of the relationship between the variables studied. In conjunction with self-efficacy, Nur Rahmah (2018) states that the jigsaw method cooperative learning strategy becomes a tool to improve self-efficacy [18]. Research in math suggested that the application of cooperative learning with the jigsaw method affected mastery and the ability to learn from others. Jigsaw increases students' self-efficacy capabilities [19]. Darnon et al also concluded that students' self-efficacy increased in groups that received learning with jigsaw methods [20]. Self-efficacy increases through two important processes, modeling which is commonly called the vicarious experience and mastery experience. But it is difficult to determine whether it is increasing because of two things or indeed because of the dynamic application of jigsaw methods in the classroom. Some results showed that although the Jigsaw method increases academic achievement, the application of the jigsaw method is not always successful in increasing self-efficacy [21]. That study supports previous research which stated that students do not believe that Jigsaw method is more effective than other teaching methods [15]. The mechanism of gender differences and self-efficacy in learning Jigsaw's cooperative methods to date is still unclear. This study aims at analyzing neurocognitive in gender relations and dimensions of self-efficacy in Jigsaw learning method in studying EFL.

2 RESEARCH METHOD

2.1 Research Design

This study was a mixed method use Sequential Explanatory type research. This research model is characterized by

- Lufiana Harnany Utami, is a lecturer at UIN Sunan Ampel, currently pursuing doctoral degree program in Universitas Negeri Malang. E-mail: lufiuin@gmail.com
- I Nyoman Sudana Degeng, Gunadi Harry Sulisty, Tutut Chusniyah, are senior lecturers at Universitas Negeri Malang. E-mail that can be contacted: tutuchusniyah@gmail.com
- Ambar Sulianti is lecturer at UIN Sunan Gunung Djati. E-mail: ambarsulianti@uinsgd.ac.id

conducting quantitative data collection and data analysis in the first stage, and followed by the collection and analysis of qualitative data in the second stage, in order to strengthen the results of quantitative research conducted in the first stage. The sample is 280 senior high school students in Malang, East Java province, Indonesia. The entire sample was in grade 3 high school students who had attended English lessons for 8 meetings. One hundred and forty students studied using

conventional methods and the same number of learning Jigsaw methods. The Jigsaw group followed the Jigsaw-1 cooperative learning method. The conventional group with the teacher method explained in front of the class using multi-media. The Sequential Explanatory design is presented in Figure 1 below.

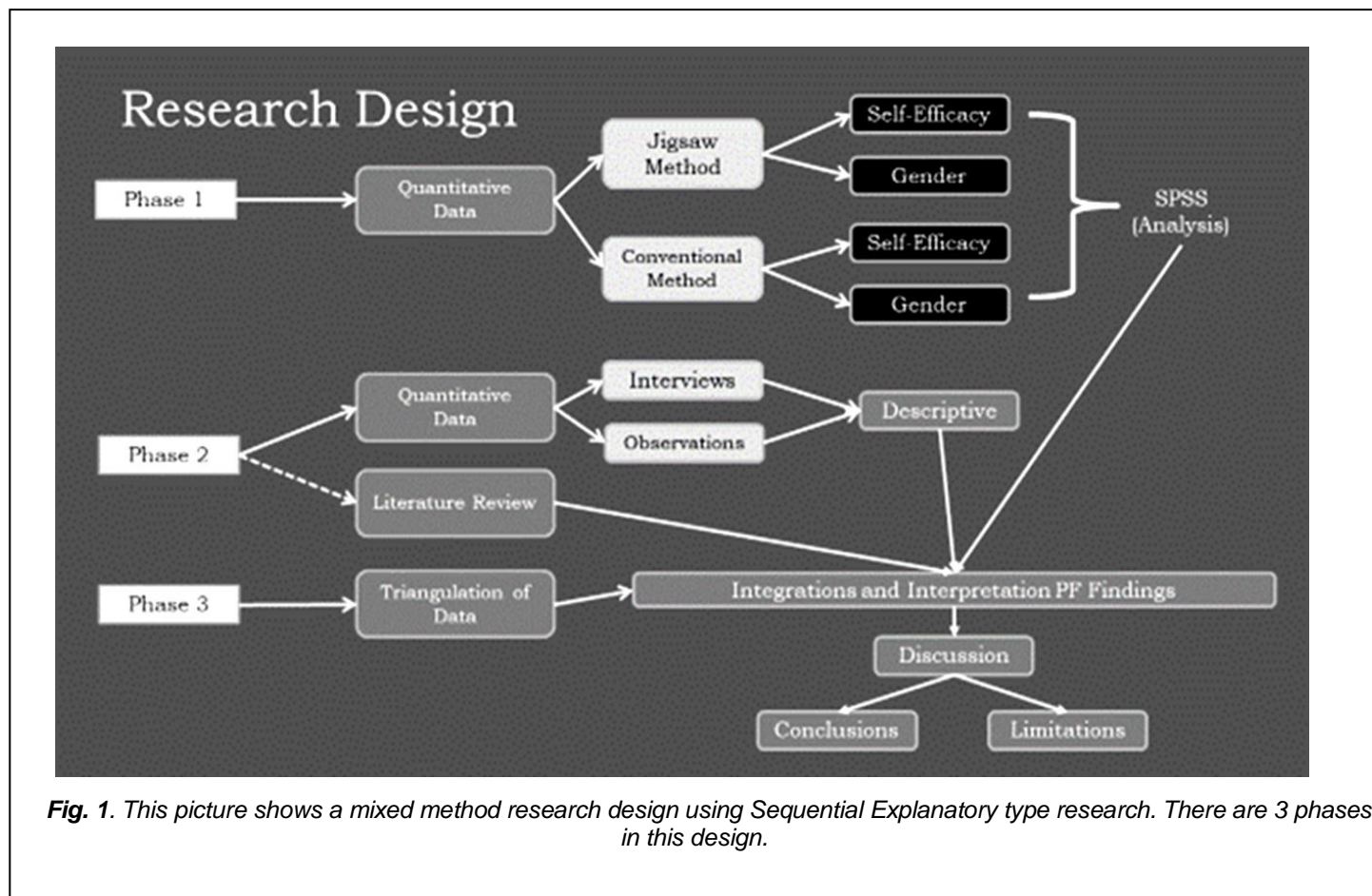


Fig. 1. This picture shows a mixed method research design using Sequential Explanatory type research. There are 3 phases in this design.

In phase 1, quantitative data was collected using a self-efficacy questionnaire that had been tested for validity and reliability. Different tests were performed using MANOVA SPSS to see differences in self-efficacy in groups of females using the Jigsaw method, males using the Jigsaw method, females using the conventional method, and males using the conventional method. The difference in self-efficacy is seen in each dimension, i.e. Self-efficacy in enlisting social resources,

academic achievement, self-regulated learning, and Self-assertive efficacy. In phase 2, observations and interviews were conducted with students to obtain qualitative data of their learning experiences using the Jigsaw method. Next is alignment with literature studies to match the mechanism by biopsychology. The last step is to triangulate data to discuss the problems in this study.

2.2 Research Instruments

The instrument for measuring self-efficacy was adopted from the Self-Efficacy Scale developed by Bandura, and through testing validity and reliability, consisting of 26 questions consisting of 11 favorable statements and 15 unfavorable statements. The statement reveals the self-efficacy experienced by respondents in the language learning situations that they undergo. The self-efficacy scale consists of four dimensions, namely 6 statements of self-efficacy in

enlisting social resources, 7 statements of self-efficacy for academic achievement, 6 statements of self-efficacy for self-regulated learning and 7 statements of self-assertive efficacy.

2.3 Statistic analysis

The statistical analysis used in this study began with descriptive categorical of each group, continued inferential MANOVA to see the differences in the four dimensions of self-efficacy in female and male students in the Jigsaw method

group and the conventional group. Bonferroni post hoc tests were conducted (according to the homogeneity test results) to see the significance of the differences in each group. Data triangulation is used by combining quantitative, qualitative, and literature review data and then integrated and interpreted.

3 RESULTS

The description of the dimensions of self-efficacy in males and females in both the Jigsaw and conventional groups is presented in table 1.

TABLE 1
DESCRIPTIVE DIMENSIONS OF SELF-EFFICACY

	Gender	Mean	Std. Deviation	N
Self-Efficacy in enlisting social resources	Male Jigsaw	2.8767	.41133	88
	Female jigsaw	3.0699	.44572	69
	Male conventional	2.9681	.46082	67
	Female conventional	2.8957	.44147	56
	Total	2.9500	.44244	280
Self-efficacy for Academic achievement	Male Jigsaw	2.8375	.37897	88
	Female jigsaw	2.9916	.53369	69
	Male conventional	2.9701	.47271	67
	Female conventional	2.8571	.49494	56
	Total	2.9111	.46913	280
Self-efficacy for Self-regulated learning	Male Jigsaw	2.7632	.43606	88
	Female jigsaw	2.9610	.49651	69
	Male conventional	3.0045	.53446	67
	Female conventional	2.8454	.54787	56
	Total	2.8861	.50594	280
Self-assertive efficacy	Male Jigsaw	2.8411	.52266	88
	Female jigsaw	3.0958	.49837	69
	Male conventional	2.9810	.57860	67
	Female conventional	2.8445	.63365	56
	Total	2.9380	.56159	280

The results of the analysis showed that the mean of self-efficacy in Jigsaw and conventional male and female groups differed on the four dimensions of self-efficacy. It could be seen in Table 1 that for the dimension of self-efficacy in enlisting social resources, the group of female students in the Jigsaw group had the highest mean value of 3.07 ± 0.45 . For the dimensions of self-efficacy for academic achievement, the highest average score of Jigsaw group women was 2.99 ± 0.53 . For self-efficacy for self-regulated learning, the highest average was in the male group in the conventional method of 3.00 ± 0.33 . For the dimensions of self-assertive efficacy, the highest mean value was returned to the female group of the jigsaw method which was 3.10 ± 0.50 . The data were then categorized to be high, medium, and low as illustrated in

Figure 2.

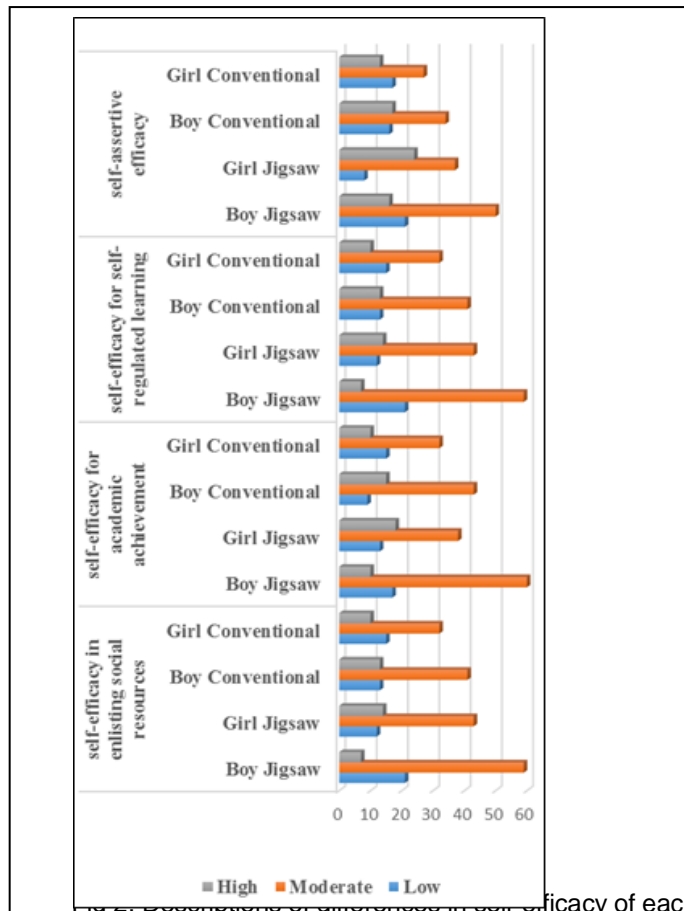


Figure 2 shows the variation in self-efficacy in men and women in each group. Furthermore, homogeneity testing between variables was carried out, shows in table 2.

TABLE 2
LEVINE'S TEST OF EQUALITY OF ERROR VARIANCES

	F	df1	df2	Sig.
Self-efficacy for Academic achievement	2.580	3	276	.054
Self-efficacy for Self-regulated learning	1.047	3	276	.372
Self-assertive efficacy	1.737	3	276	.160
Self-Efficacy in enlisting social resources	.364	3	276	.779

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

Design: Intercept + Gender

Levine's test showed that there was equality of variance values in the self-efficacy in enlisting social resources ($F = 0.364$; $p > 0.05$), self-efficacy for academic achievement ($F = 2.580$; $p > 0.05$), self-efficacy for self-regulated learning ($F = 1.047$; $p > 0.05$), and self-assertive efficacy ($F = 1.737$; $p > 0.05$). Inferential testing was continued using the MANOVA test presented in Table 3.

TABLE 3
STATISTICAL ANALYSIS OF MANOVA

Effect		Value	F	Hypothesis df	Sig.
Intercept	Pillai's Trace	.980	3.330 ^a	4.000	.000
	Wilks' Lambda	.020	3.330 ^a	4.000	.000
Gender	Pillai's Trace	.074	1.737	12.000	.055
	Wilks' Lambda	.927	1.740	12.000	.055

a. Exact statistic

b. Computed using alpha = .05

d. Design: Intercept + Gender

Through simultaneous analysis, there were significant differences between the two tested variables (gender and Jigsaw method) which were reviewed by the four dimensions of self-efficacy ($F = 3.330$; $p = 0.000$). The negotiation type explains the effect size through eta squared of 0.02 which showed an effective contribution in explaining the two variables was 20 percent. Thus, the major hypothesis of this study which states that there is an influence of gender and Jigsaw learning methods on self-efficacy in using social resources, self-efficacy for academic achievement, self-efficacy for self-regulated learning and self-assertive efficacy is accepted, although the relationship among gender, Jigsaw method, and self-efficacy are weak. Follow-up tests conducted using the Bonferroni method showed that the self-efficacy in enlisting social resources female in the Jigsaw group was higher than female in the conventional group ($MD = 0.174$; $p < 0.05$) and male in Jigsaw ($MD = 0.193$; $p < 0.05$) and male conventional groups ($MD = 0.102$; $p < 0.05$). The self-assertive efficacy, female students in the Jigsaw group was higher than female in conventional group ($MD = 0.116$; $p < 0.05$) and male in Jigsaw ($MD = 0.255$; $p < 0.05$) and male conventional groups ($MD = 0.115$; $p < 0.05$). Conversely the difference in the dimensions of self-efficacy for academic achievement among all groups were not significant ($p > 0.05$). The self-efficacy for self-regulated learning male conventional groups was higher than male in Jigsaw ($MD = 0.241$; $p < 0.05$), female in Jigsaw group ($MD = 0.046$; $p < 0.05$), and female in conventional group ($MD = 0.159$; $p < 0.05$).

4 DISCUSSIONS

The purpose of this study was to carry out neurocognitive analysis in relation to gender and self-efficacy in jigsaw cooperative learning. There were four results of research monitoring the self-efficacy dimensions studied. The first finding of the results of this study showed there was influence of the Jigsaw method on self-efficacy in enlisting social resources in female students. This is in line with the results of Sengul and Katranci's study which showed the Jigsaw method increases self-efficacy [22]. This may be explained that in female students, the environment in Jigsaw learning increased students' motivation to show their ability in front of other students. Good perception starts with a good first impression. Female students considered the division of groups evenly opened opportunities for them to show their abilities. They felt recognized as equals with men. This made them felt curious about the EFL chapter that would be studied that day. In a neurocognitive review, the curiosity can release of Dopamine

and Endorphin which increase the happiness in learning [23]. They had the confidence and courage to look for answers to their friends and teachers. This situation promoted inquiry and conditions the high-level thinking process. In Cognitive constructivist's theory, social interaction is rooted in individual congressional processes [24]. High motivation built the creativity of female students. However, the results of this study indicate that there was no significant difference in self-efficacy in listing social resources between male students using Jigsaw and conventional methods. From our observations, male students worked on as many tasks as possible in the small Jigsaw group, however, when male students could not do their assignments, they tend not to ask questions and then did other things that were preferred such as engrossed in writing something that was not related to the lesson. Based on Bandura's theory, self-efficacy refers to the individual's beliefs about their innate abilities to achieve specific goals or aspects of self-concept that focus more on cognitive and descriptive representations of one's abilities. Belief about self-efficacy does not depend on his ability but on the belief that he can complete a job with a set of skills possessed. Social Cognitive theory explains the human functioning that considers humans to control their behavior. Individuals have a self-beliefs system that enables them to control their thoughts, feelings, and actions. According to this theory "what people think, believe, and feel affects how they behave". Male students using the Jigsaw method had a lower self-efficacy in enlisting social resources but were not significant, than students who used conventional learning methods. Possibly it was caused by those in the small group were not prepared to study the chapter that will be discussed that day. In neurocognitive theory, humans often change self-motivation to get psychological satisfaction mediated by Dopamine [25]. The unpreparedness of male students made them embarrassed to ask because it would show their weaknesses so that they wouldn't get the reward of satisfaction psychologically. The second finding in these results regarding the dimensions of self-efficacy for academic achievement, both men and women with the jigsaw method and conventional methods did not show a significant difference. It may say that jigsaw method did not increase self-efficacy for academic achievement. Their confidence in the mastery of the EFL did not increase by changing the learning method to the Jigsaw method. In Bandura theory, self-confidence in academic work is influenced by the practice of teacher assessment and evaluation of their performance [26],[27]. The comparative evaluation by the same teacher of students in this study was the same between the Jigsaw group and the conventional group. In the dimension of self-efficacy for self-regulated learning, female students did not show significant differences between the jigsaw group and conventional methods. On the other hand, male students in the Jigsaw group had significantly lower self-efficacy for self-regulated learning than the conventional group. Perhaps in their perception, learning English as EFL was an unpleasant thing so grouping them in small teams that were not directly monitored by the teacher, made the relationship between students and teachers as a substitute for parents in schools, was looser. Male students reported that they did not consider the task given by their friend in small groups, different from male students in conventional groups whose assignments were given directly by the teacher. The student-teacher relationship theory states that the closeness of the student-teacher relationship

motivates students to look at their compatibility with the world and facilitate student change to adapt to the environment in achieving goals [28]. On the contrary, female students felt challenged by the tasks and wanted to prove their existence in front of their friends. Finally, the findings in this study showed female students in the Jigsaw group had significantly higher self-assertive efficacy than male and female in the conventional method's group. It may say that Jigsaw method increased self-assertive efficacy in female students. An explanation that might support this condition was female students in the Jigsaw group motivated and guided their actions through proactive control by setting their own challenging goals. In development psychology, adolescent women are generally more capable to process words and use language than men. Women pay special attention to words and can read body language and other people's facial expressions. This is in line with the research suggests that in female students, the cognitive achievement is related to creativity. Several science and gender studies from various fields such as psychology, sociology, philosophy, and various branches of education show women's motivation in science is lower than that of men [29]. This made female students facilitate each other in one small group of the jigsaw and between groups. Social cohesion occurred in the Jigsaw group of female students. The neurocognitive social theory suggests that cognitive processing in the brain is closely related to social processing of emotions. The structure of the brain involved in social events is also related to the processing and regulation of emotional states [30]. On the other hand, male students did not feel that assignments given in small groups are challenging target goals. This was likely influenced by the cultural environment. In the perception of male students, the position of assignors and friends in small groups was not higher than one another. This caused male students not to set high goals in completing tasks so that disequilibrium conditions were not formed that made male students challenged to prove their opinions or defend them.

5 CONCLUSION

Based on the results of this study concluded that the jigsaw method increased self-efficacy in enlisting social resources and self-assertive efficacy in women. The Jigsaw method had no effect on male and female self-efficacy for academic achievement. The dimensions of male self-efficacy for self-regulated learning in the conventional group were higher than in the Jigsaw group. Perceptions, motivations, and social cohesion abilities of students need to be examined more deeply in relation to the dimensions of self-efficacy in the jigsaw learning method. The teacher's explanation of the learning objectives and the importance of the learning method need to be put forward at the beginning of the teaching and learning process. The capability of the teacher as orchestrators in Jigsaw methods needs attention.

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