
# The Effect of the Jigsaw Technique Implementation on Prospective Teachers' Academic Achievements

**Kerim GÜNDOĞDU[5], Ceyhun OZAN[6], & Adnan TAŞGIN[7]**

5 Assoc. Prof. Dr. Adnan Menderes University, Turkey
6 Res. Assist., Atatürk University, Turkey
7 Res. Assist., Atatürk University, Turkey

**Abstract**
*This study investigated the effects of the jigsaw technique on the achievements of sixty-four freshman students in an Educational Psychology course. The jigsaw method is a cooperative learning method that was applied to the experimental group, while the traditional learning method was applied to the control group. The subjects were all prospective teachers taking the Educational Psychology course in Turkish Language Education department in a public university in Turkey during the second term of the 2008 -2009 academic year. According to the results of the study, the test group appeared to be more successful than the control group in terms of post-test and knowledge retention scores.*

**Key words:** Jigsaw technique, educational psychology, cooperative learning, prospective teacher

## Introduction

Individualized learning practices have been utilized for decades at all levels of education, from primary grades to higher education classes. Intellectual ability is seen as a characteristic of the individual, according to both Piagetian and behaviorist theory. However, in recent years a greater emphasis has been placed on the social development of the individual. Research findings show that social interaction within learning environments has a great effect on cognitive development (Hill & Hill, 1990).

Cooperative learning is not a new phenomenon and much has been written about the effects of it on student achievement, student motivation and attitudes. We understand from the overwhelming studies of D. Johnson, Slavin, Farivar, Holubec, Hollifield, Schmuck, Sharan and Aronson (cited in De Ligny, 1996) that cooperative techniques positively affects the acquisition of knowledge, the development of social relations of students and improves self-esteem What is cooperation? Cooperation in the learning environment is the interaction of at least two individuals, to achieve the same goals. In this interaction, positive interdependence and goal similarity are the two key essentials (Hill & Hill, 1990). Cooperation or cooperative skills can be learned by engaging in a process that allows groups to reach common goals and to understand that they will be more successful if they work together. As Gillies explains (2007), the cooperative learning process requires that students work together to accomplish common goals.

This process facilitates socialization of the learner from kindergarten through university. In the learning-teaching process, when techniques and methods to make students participate in the lesson are used, the students learn in the best way, and they remember more fully and enjoy what they do. The cooperative learning method, which was developed from theoretical and applied surveys (Oral 2000), facilitates student participation.

The cooperative learning method is defined as a learning approach in which students form small mixed groups to help each other to learn an academical lesson; they share identical aims, and the success of the group is awarded in different ways (Gömleksiz, 1997). The group members cooperate by teaching each other or doing a part of the work. This is called “subordination of the inward” or “subordination of purpose.” Each student’s learning in the group is affected by the learning or the endeavors of the other students in the group. Because of this, everybody in the group is responsible for each other’s learning, and abilities can be shared (Açıkgöz 1993). This

style provides an alternative to decrease the weight of traditional, teacher-based teaching methods (Sharan & Sharan, 1999).

According to Gillies (2007), the success of the cooperative learning method depends on the group's possession of positive interdependence and cooperation, individual accountability, promotive interaction, and ability to evaluate and improve. Johnson, Johnson, and Smith (1998) further explained these crucial factors: each member must be consciousness of his/her responsibility for the learning of the others. Every student in the group must be aware of the fact that his/her own effort is beneficial to everyone in the group, and also that every other member's effort is beneficial to him/her. The success of the group depends on each one of the group members striving to fulfill their common learning aims. Slavin (1990) states that all studies on cooperative learning indicate the importance of team rewards and individual accountability. The theory is that positive interdependence motivates the whole group to do the best they can. The most important aim of the cooperative learning groups is to ensure that each member is accountable for his/her behavior, performance, and success. All learners in groups are responsible to try to do their best. Each member of the group should also be aware that unique contributions are important. Group members should explain to each other how they solve the problems that they face, discuss the ideas that they get, and encourage, support, and help one another. They help to promote and to improve their mutual success through continuous interaction. One of the goals of cooperative learning is that the learners' social skills will increase in such an atmosphere. The last element of cooperative learning is group processing. This allows group members to obtain self-evaluation skills. Such evaluation not only helps the group members to work with maximum efficiency in their learning activity, but also further encourages the habit of working together in groups.

Student teams and success divisions, team-game-tournaments, cooperative integrated reading and composition, team-supported individualization, "let's ask and learn together," integration, and mutual questioning can be regarded as techniques of the cooperative learning method (Baykara 2000).

*Jigsaw method*

One of the most effectively used cooperative learning techniques is the jigsaw method. It was originally developed by Elliot Aronson and his colleagues, specifically to solve the school desegregation problem. The interaction problem between the black and white students was solved through Jigsaw by placing students in small heterogeneous groups and assigning tasks so that students could make their own contributions to the groups with extreme interdependence (Abrami et al., 1995; Kagan, 1997).

The technique requires that every student in the group share knowledge in every part of the course. Also, students in each group should feel responsible for the success of the other members. It is possible to generate cooperation between individual Jigsaw groups. A key feature of this technique is pointing out that the students' individual grades depend on each member's performance. Therefore, there is no group award for success. Though members of a group, each student is personally responsible for studying the whole lesson (Knight & Bohlmeyer, 1990).

Although the Jigsaw approach has been flexible in its implementation, all learners who work in small groups must understand that mutual trust is required in this approach. Every learner in the group becomes an expert on the topic studied and contributes by helping his/her classmates. The name Jigsaw reflects a metaphor that means putting all the pieces a puzzle

together to see the whole picture. Although the Jigsaw approach can be applied flexibly in learning environments, it has four major stages in all applications (Clarke, 1999):

*Introduction stage*: The teacher organizes the students into heterogeneous original groups. Then s/he introduces the theme and the rationale of the theme to be studied. It is crucial to generate interest in the lesson among the students. Learning and assessment procedures are finally explained.

*Focus group stage*: New focus groups are organized by the students from the original groups to study and learn the specific topic in detail. In this stage, the teacher encourages the students by allowing them to think out loud in a free atmosphere. The students are directed to explore the main ideas and the ideas of others in the focus groups.

*Reporting and reshaping:* The students return to their original groups to explain what was learned and generated in the focus groups. Discussing, asking questions, interacting, and explaining are encouraged by the teacher. Thus, the students begin to understand the topic as whole, as they understand the work done by their peers.

*Integration and evaluation:* The students are encouraged to design an activity in their original groups to demonstrate what they have learned from others.

Aronson's original model was redesigned by Slavin (1990) and his colleagues in what they called Jigsaw II. In this model, the students should revisit the studied material 'through the lens of different perspectives to deepen conceptual understanding of significant themes, frameworks, or central ideas' (p. 37). In Jigsaw II, the extrinsic reward structure is also benefited. Heterogeneous teams generated on the basis of their performance levels teach each other and are assessed individually by means of quizzes on all the themes. The scores from these quizzes are averaged into one team score. Then, the winning teams are declared, to build a competitive spirit among the teams and to encourage them to cooperate to increase their team scores (Slavin, 1990). Although several variations were created by educators within the stages of the method (Kagan, 1997: Reid, Forrestal, & Cook, cited in Clarke, 1999), the idea of highlighting the cooperation, contributions, and peer teaching remains the same.

*Research on cooperative learning and Jigsaw*

Theory and experimental studies conducted in learning environments suggest that cooperative activities should be taken into consideration if educators wish to enhance the intellectual and social development of students. Twenty-one of the twenty-six studies conducted by Johnson and Johnson that investigate academic achievement clearly show that co-operative learning activities overwhelmingly promote higher academic achievements more effectively than other training methods. In addition, according to a meta-analysis by Johnson, Maruyama, Johnson, Nelson, and Skon on 122 cooperative learning studies conducted between 1924 and 1981 (1981, cited in Hill & Hill, 1990), the overall trends clearly indicate that cooperative learning methods generate higher academic achievements than individualized learning experiences.

In response to this meta-analysis, Slavin compiled and investigated 46 studies on cooperative learning activities which measured individual achievement and concluded that a vast majority of the studies showed positive effects on achievement. Slavin also found that increase in self-esteem was another crucial achievement of cooperative learning activities. Johnson and Johnson's analysis of a further study showed that positive interdependence, which means

interacting with and depending on one another to be successful, is the key requirement in cooperative activities, rather than simply rewarding individualistic behaviors (Aronson & Patnoe, 1997).

A team of educators launched a longitudinal project to restructure the teaching and learning process to reduce the competitive ethos based on the "win" or "lose" concept that was pervasive in schools in 1972. They attempted to develop equal opportunities and to support an affective environment through more collaborative work, interaction, and mutual trust (Clarke, 1999). The Jigsaw technique was originally developed to bridge the gap between different ethnic groups of children. However, its results are not limited to multicultural learning environments. Aronson and Patnoe (1997) stated that while individualized instruction benefits from independent activities, developing the social skills of the child is neglected. Employing jigsaw activities in a learning environment may provide a balance against the competitive classroom environment. It is a way of building a classroom community where all learners feel valued (Clarke, 1999).

After a full-scale jigsaw study, Aronson and Patnoe (1997, p. 92) concluded that "a strong, positive pattern of behaviors, feelings, and abilities could be attributed to jigsaw groups." They also found a difference in performance between jigsaw and competitive classes in favor of jigsaw classes, after an experimental study.

There are many additional studies on the positive effects of cooperative learning in the academic success of learners throughout the world (Açıkgöz, 1993; Avşar & Alkış, 2007; Baykara, 2000; Bilgin & Geban, 2004; Cooper & Mueck, 1990; Delen, 1998; Dougherty, et al., 1995; Doymuş, Şimşek, & Bayrakçeken, 2004; Erdem, 1993; Gömleksiz, 1993; Gömleksiz & Onur, 2005; Gömleksiz & Tümkaya, 1997; Gömleksiz & Yıldırım, 1996; Johnson, et al., 1981; Johnson & Johnson, 1974; Karaoğlu, 1998; Kıncal, Ergül, & Timur, 2007; Leung & Chung, 1997; Oral, 2000; Öner, 1999; Özder, 1996; Özkal, 2000; Pala, 1995; Potthast, 1999; Quarstein & Peterson, 2001; Sarıtaş, 1999; Sezer & Tokcan, 2003; Slavin, 1990; Sharan, 1980; Tarım & Akdeniz, 2008; Tok, 2008). But few studies have been conducted on Jigsaw as a cooperative learning method. The achievement rates of students in Jigsaw classrooms are higher than those in traditional instruction classrooms (Avşar & Alkış, 2007; Beckett, 2009; Frazee, 2004; Gencdogan, 2007; Kılıç, 2008; Stepka, 1999). Most of the studies in the literature on cooperative learning are quantitative. However, there are some qualitative studies reflecting the effect of the cooperative learning techniques. For example, Jefferies (1987) contends that students enjoyed learning through planned student interaction, especially peer teaching in a qualitative investigation.

On the other hand, the results of a study (De Ligny, 1996) showed that although the Jigsaw technique did not have a significant impact on the achievements of students, a significant improvement was observed in peer respect, motivation, positive interdependence and self-esteem. Regarding changing the attitudes and achivement, Webb's (1992) study clarified that Jigsaw did not significantly reduce prejudicial attitudes, and did not increase academic achievement in college students.

As seen in the literature, most of the studies are related to secondary school level and few of them are administered at higher education level. After all, there are numerous of studies approving the positive effect of the cooperative techniques on student achievement, and a few studies that did not create any difference on student achievement or on their attitudes. The literature show that cooperative learning strategies generally result in positive affective and

cognitive outcomes. On the other hand, some studies run contrary to previous researches. For example, Anderson (1985) found that although further research is suggested to determine the reliability, the attitudes and achievement of the students did not significantly changed after an experimental study involved Jigsaw technique. As parallel to this finding, Webb (1992) concluded that the Jigsaw did not significantly reduce prejudicial attitudes or increased the academic achievement of college students.

The purpose of this study is to investigate the effects of the Jigsaw cooperative learning method on the academic success of prospective teachers.

*Research question*

Is there a significant difference in the academic achievements of prospective teachers who are taught according to the Jigsaw cooperative learning technique and the traditional methods and techniques?

## Method

*Research Design*

A pre-test/post-test, control grouped quasi-experimental design was used in this study (Büyüköztürk, Çakmak, Akgün, Karadeniz, and Demirel, 2008). Two randomly selected groups were employed as the study groups. One of these was designated the experimental and the other the control group. The experimental group received the Jigsaw cooperative learning method of instruction, and the control group received the instructor-based traditional method. In order to avoid researcher bias, different instructors delivered the instructions in both groups. At the beginning of the academic year, both researchers were trained in the delivery of the course in two different ways while preparing the outline of the course. In the study, quantitative data were collected, and statistical analyses were performed.

*Study Group*

This study was conducted with 68 freshman students of the Turkish Education Department enrolled to the Educational Psychology course at Atatürk University in the 2008 - 2009 academic year in Turkey. Group A was the experimental group (received Jigsaw technique), while Group B (received traditional lecture technique) was the control group. Each consisted of 34 students, selected randomly.

*Data Collection Procedures*

In the study, both the experimental and control groups received two weeks of instruction (six hours) about “contemporary teaching strategies.” In order to evaluate their initial knowledge of the subject, a pre-test with 25 multiple choice questions was administered. Beginning the week after the pre-test, both groups were trained for three hours a week over two weeks. At the end of this period, a post-test containing 25 questions was administered to both groups. In order to prevent the students from studying for the post-test, they were not informed that the test would be repeated. Three weeks after the post-test application, in order to evaluate their retention of the acquired knowledge, the same post-test was given as the retention test again. The steps of the jigsaw technique that was used in this study are described below:

The classroom was divided into seven groups, each one containing five students. There were four students in one of the groups. Each group was assigned one of the seven subjects of the overall educational psychology lecture course. Then that group was named after the name of the subject it received. In each group, a leader was chosen to learn and teach the subject to that group. Each member except the group leader was sent to the other groups for two classes, in order to learn the other subjects. So new groups were formed, but the group leaders were fixed. The group members who learned the subjects of the other groups returned to their own group at the end of the course. Each group member who came back to his/her own group explained the subjects that s/he learned to the other members of the group. Seven different subjects of the Educational Psychology course were studied in this way during two weeks.

**Results**

The standard deviations and arithmetic means derived from the pre-test, post-test and retention test are given in Table 1.

Table 1. *Pre-test, post-test and retention-test mean scores and the standard deviations of the experimental and control groups.*

| | | **Pre-test** | | **Post-test** | | **Retention** | |
|---|---|---|---|---|---|---|---|
| | N | X | sd | X | sd | X | sd |
| Experimental | 34 | 60.35 | 12.78 | 74.88 | 9.25 | 72.06 | 8.53 |
| Control | 34 | 57.88 | 13.00 | 65.18 | 11.03 | 63.41 | 10.89 |

As can be seen from the table, while the mean score of the experimental group in which Jigsaw instruction employed was 60.35; this mean score increased to 74.88 in the post-test and found to be 72.06 in the retention test. The mean scores of the control group in which traditional methods employed were 57.88, 65.18 and 63.41 respectively. According to these findings, pre-test and post-test mean scores increased both in experimental and control groups. However, considering the retention test scores, some decreases were observed in the mean scores of the candidate teachers after the administration of retention tests in both experimental and control groups after three weeks. In order to understand whether pre-test, post-test and retention test mean scores of the prospective teachers in both groups were significant, 2X3 two-way ANOVA for mixed measures was done. The results are presented in Table 2.

Table 2. *ANOVA results for the experimental and control groups concerning the pre-test, post-test and retention-test scores*

| **Source** | **Sum of Squares** | **S.D.** | **Mean Squares** | **F** | **p** |
|---|---|---|---|---|---|
| Between groups | 16566.352 | 67 | | | |
| (Group) Jigsaw / Traditional | 2457.176 | 1 | 2457.176 | 11.494 | .001 |
| Error | 14109.176 | 66 | 213.775 | | |
| Within Group | 15037.333 | 136 | | | |
| Measurement (Pre–Post-Retention) | 4501.451 | 2 | 2250.725 | 29.660 | .000 |
| Group * Measurement | 519.176 | 2 | 259.588 | 3.421 | .036 |
| Error | 10016.706 | 132 | 75.884 | | |
| Total | 31603.685 | 203 | | | |

The results show that there are significant differences before and after the treatment program among the pre, post and retention test scores of the candidate teachers (F(1-66)11.494, p<.05; ɲ2=0.078 ). This finding shows that the mean scores of prospective teachers in the experimental and control groups differentiate regardless of considering pre and post measurements. Related to the measurement main effect, it can also be understood from the table that there was a .significant difference between the mean scores of the candidate teachers in both groups from the beginning to after-treatment (F(2-132)=29.660, p<.05). These findings show that there is a significant difference between the mean scores of two groups without making group and measurement separation.

It is also observed that the attitude mean scores of the subjects participating in two different treatments, Jigsaw and traditional, significantly differs from the beginning to after-treatment. So, this finding indicates that being in different treatment groups and repeated measure factors have significant common effects on the human rights education attitudes of the prospective teachers (F(2-132)=3.421, p<.05). This finding shows that the changes in the test mean scores of the candidate teachers in the experimental group in which Jigsaw technique employed were significantly different from the changes in the test mean scores of the candidate teachers in the control group in which traditional lecture technique employed. So, receiving cooperative (Jigsaw) and traditional instructions have different effects on increasing the achievements of candidate teachers. However, the Jigsaw instruction is more effective in retention of the knowledge gained in teacher training process, than traditional instruction.

Figure 1 briefly shows and summarizes the effects of treatment program with regard to pre-test, post-test and retention scores of the prospective teachers.

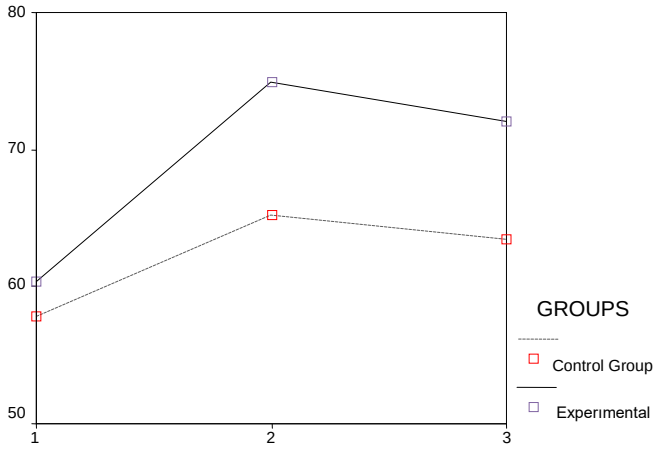


Figure 1. *Changes of the pre, post and retention scores in the experimental and control groups*

## Discussion

In this study, the experimental group which was trained with the jigsaw technique was more successful than the control group trained with the traditional teaching-learning methods. This suggests that the jigsaw technique allowed the students to reach a maximum level of learning, by participating in the learning-teaching process personally and teaching each other.

This conclusion supports the findings of a majority of other studies that show the jigsaw technique affects students' academic accomplishments positively (i.e.. Avşar and Alkış. 2007). Jigsaw technique was also implemented in different courses and settings. In the Oscoz`s (2003) study, the Jigsaw task produces significantly more accurate language and negotiation of meaning than free discussion. In the study of Wang (2006), students learning cooperatively had higher final course grades and made more integrative statements on the measure of orientation toward learning English than students who learned using the traditional Chinese methods. In a very different learning setting, Frazee (2004) found that students in the Jigsaw class perceived more strengths and fewer weaknesses with the WebQuest than the No Jigsaw class. They also shared more positive and fewer negative remarks regarding overall satisfaction with the WebQuest experience.

Literature indicates that the educators aware of the impact of cooperative activities in schools. For example,in the study of Basamh (2002), the overall attitudes of principals and teachers towards implementing cooperative learning methods were positive. The majority of the principals evaluated cooperative methods as a beneficial, %87 were willing to implement cooperative methods, %83 believe that their teachers could implement such methods, and most of them would support the implementation of cooperative learning methods.

Although the applications of the post-test and retention-test period seem to be short, a significant difference was found between the knowledge retention mean scores of the two groups in this study. Therefore, it can be concluded that although the jigsaw technique has a positive influence on the learning of materials in the educational psychology course, and it does have a more effective influence than the traditional method on retention of knowledge level of the prospective teachers. However, it is suggested for the future researchers that the period between the post-test and retention test should be longer.

**Conclusion and implications**

Educators throughout the world accepted the positive effects of the cooperative instruction especially on learners' social skills, as well as achievements. Many studies showed its effect on student achievement, and most of the studies specifically focused indicated its effect on the attitudes and appreciation process in learners. According to these results, jigsaw technique is suggested as a useful cooperative learning method for teaching the subjects comprising the educational psychology course, as well as other teacher training courses. But, the method may only be effective if the teachers know the cooperative learning- specifically the jigsaw technique well, and the physical educational setting is suitable to apply this technique. Since the researchers had certain difficulties with transforming the traditional environment into the cooperative one, the learning environment should be designed around the cooperative learning requirements to be more effective prior to instruction.

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