



IMPACT OF COLLABORATIVE LEARNING METHOD ON TEACHING PLAN PREPARATION OF PRE-SERVICE MATHEMATICS TEACHER

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Abstract

This study examines the impact of a collaborative learning method on teaching plan preparation for pre-service mathematics teachers. The study was involved 138 pre-service mathematics teachers of a state University Education Department of Primary Mathematics Education in South of Turkey. The impact of the collaborative learning method on pre-service teachers was examined using the items in the measurement form. It was seen that collaborative learning generally has a positive impact on pre-service teachers. It was realized that this method creates an original product; cooperation by group members, which helps them perform a given task, what is demanded is perceived more easily, and the group can attain the desired academic level reached individually more rapidly. In addition, pre-service teachers emphasized that this method will develop their social skills and the reliability of the knowledge will be understood more quickly.

Keywords: Collaborative learning method, Plan preparation, Mathematics education, Affective Impacts, Behavioral Impacts, Cognitive Impacts.

INTRODUCTION

Throughout the world, education systems attach importance to the active participation of students in learning through their own experiments and experiences. Almost all of the modern educational approaches suggest that students should be more active in school and in class and participate directly in their learning (Kara, Bicen and Uzunboylu, 2009). In modern education systems, the main role of teaching is defined as teaching methods of learning, accessing knowledge, and guiding students in this process (Artzt and Newman, 1990; Harden and Crosby, 2000; Şişman and Turan, 2001; Çakmak, 2004; Özer, 2005; Schwarz, Hershkowitz and Azmon, 2006; Yeşilyurt, 2009). Collaboration is a method people use at every stage of their lives although they may not be aware of it. Human beings are obliged to collaborate and work in accordance with a purpose in order to overcome many of the problems encountered in daily life. Collaborative learning is an approach brought about by this process. Collaborative learning is one of the approaches that help students learn by enabling them to be active in the learning environment (Slavin, 1990). Many studies are available in literature that examines the collaborative learning method (Bilgin and Akbayır, 2002; Özmantar, 2005; Stahl, Koschmann and Suthers, 2006; Rae, Roberts and Taylor, 2006; Choo at all., 2009). The main reasons for collaborative learning attracting so much attention are as follows (Açıkgöz, 1995 citer: Kara, Bicen and Uzunboylu, 2009):

- Collaborative learning has a more positive impact on cognitive learning products and processes when compared to other methods;
- Collaborative learning has a positive impact on such cognitive features as motive, anxiety, and attitude;
- Collaborative learning ensures the formation of a positive learning environment;
- Collaborative learning provides a suitable environment for the formation of supportive learning products;
- Application of collaborative learning does not require any special arrangement or expense; and
- Collaborative learning is convenient for the application of independent learning or for a student to direct his/her own learning.

- In addition, collaborative learning accelerates the decision-making process in problem solutions; and
- Interactive practices based on cooperation in groups increase the success average of the class (MEB, 2005).

Collaborative learning provides more benefits to the students on several levels as compared to traditional teaching (Gök and Silay, 2008; Taşdemir, Taşdemir and Yıldırım, 2009). For example, both the whole class and a particular learning group in the class achieve problem solving and learning significantly better than if acting individually. When compared to individual or competitive practices, collaboration increases motivation by providing solutions for problems through higher group and individual success, more quality reasoning strategies, more meta-cognition, and newer ideas (Kara, Bicen and Uzunboylu, 2009). Marr (1997) argued that collaborative teaching methods bring the emotion of sacrifice more to the forefront as compared to traditional teaching, and Webb (1985) put forward that collaborative teaching encourages more cooperation as compared to individual teaching, and arouses strong sacrifice attitudes (as cited in Marr, 1997). According to the findings of similar research, collaborative teaching has impact that is more positive on many learning products, success being in the first place, as compared to competitive and individual teaching (Stevens and Slavin, 1995; Gömleksiz, 1997; Neyland, 1994; Brush, 1997; Ubuz and Haser, 2002; Hevedanlı and Akbayın, 2006; Uzunboylu and Özdamlı, 2008). However, other studies report that collaborative learning does not provide more benefits than traditional teaching in some areas (Özmantar, 2005; Şimşek et al., 2006; Şimşek, Doymuş and Karaçöp, 2009).

A research question is guided the study: What is the impact of the collaborative learning method on teaching plan preparation for the pre-service mathematics teacher?

Collaborative learning can be considered as group study. However, each group study should not always be regarded as absolute collaborative learning. While some learning groups facilitate the learning of students and increase the quality of the class environment, other learning groups make student learning difficult and cause disharmony and dislike in the class environment. In such a case, knowing which group is collaborative is a necessity (Johnson, Johnson and Holubec, 1994; Johnson and Johnson, 1996 citer: Yıldız, 1999). There are differences between learning groups in terms of participation, purpose, relations, and responsibilities, motives of students, and functioning of the group process. Features of the group to be formed and success of the group members are directly related. For a group study to be regarded as collaborative learning, each student in the group must want all members of the group to learn at the highest level and behave accordingly (Slavin, 1990).

METHOD

Both quantitative and qualitative data were collected for this research. This study involves training lasting 10 weeks. We used a survey that created by Yeşilyurt (2009); however, we modified its language. The survey was applied on the experimental group at the end of the training in order to determine their opinion about collaborative learning. The impact of the collaborative learning method on pre-service teachers was examined using the items in the survey. Expressions intended for measuring affective, cognitive, and behavioral responses of students about the method were utilized while constituting the scale items. In addition, we asked an open-ended question about the plan preparing process.

Sample

The study was involved 138 pre-service mathematics teachers of the Gaziantep Faculty of Education Department of *Primary Mathematics Education*. Seventy-six of these students received training during the day while 62 of them were evening students. At the beginning of the semester, 35 different groups were constituted. Two of these groups contained three pre-service mathematics teachers while the remaining groups contained four pre-service mathematics teachers each. While constituting the groups, it was mentioned that the pre-service mathematics teacher could choose those friends with whom they wanted to study.

Data Collection Techniques

Each one of the groups was given a syllabus of the geometry course. They were asked to prepare a teaching plan relating to the syllabus within the frame of the 5E model (Driver and Oldham, 1986). The participants were told that the prepared teaching plans would be evaluated and scored. It was especially stressed that team spirit was expected from each member when contributing to the study. The groups were informed that they would present the study they prepared, and a good presentation would be awarded additional points. The progresses of the studies prepared by the pre-service mathematics teachers were monitored periodically. However, the quality of the product put forward in this study was not focused on much. Acquisitions obtained by pre-service mathematics teachers in the group study and in the process were examined. Descriptive data obtained from the research were rated from 1 (Strongly disagree) to 5 (Strongly Agree). Data were analyzed in the SPSS program. In addition, answers given to open-ended questions in the questionnaire were analyzed qualitatively.

Table 1: Article Assessment Criteria

| Alternative | Weight | Limits |
|-------------------|--------|-------------|
| Strongly disagree | 1 | 1.00 – 1.79 |
| Disagree | 2 | 1.80 – 2.59 |
| Undecided | 3 | 2.60 – 3.39 |
| Agree | 4 | 3.40 – 4.19 |
| Strongly agree | 5 | 4.20 – 5.00 |

FINDINGS

This section of the study presents findings and comments from pre-service mathematics teachers participating in the process within the frame of the collaborative learning method, irrespective of variables. At the end of the process, applied scale items were evaluated under three subheadings: affective, cognitive, and behavioral. The internal consistency reliability coefficients of subheadings are, respectively, .796, .774, and .606. These values can be considered adequate for this kind of a measurement tool.

Table 2: Affective, Cognitive and Behavioral Impacts of Collaborative Learning Method

| | N | Average | Standard deviation | t value |
|-------------------|----|---------|--------------------|---------|
| Affective | | | | |
| Day education | 76 | 3.5671 | 0.58250 | 0.608 |
| Evening education | 62 | 3.5016 | 0.68317 | p=0.544 |
| Cognitive | | | | |
| Day education | 76 | 3.6382 | 0.75432 | 0.542 |
| Evening education | 62 | 3.5645 | 0.83952 | p=0.589 |
| Behavioral | | | | |
| Day education | 76 | 3.5702 | 0.63844 | 0.570 |
| Evening education | 62 | 3.6317 | 0.62078 | p=0.569 |

It is seen in Table 2 that pre-service mathematics teachers receiving education during the day have a more positive approach towards collaborative education, affectively and cognitively, while evening education pre-service mathematics teachers have a more positive approach towards collaborative learning behaviorally. However, it was found out that this difference, as it relates to the subheadings of collaborative learning between pre-service mathematics teachers receiving education during the day and evening education pre-service mathematics teachers, is not significant. That is why evaluations were made generally.

Table 3: Affective Impacts of Collaborative Learning Method (%)

| | Strongly Disagree | Disagree | Undecided | Agree | Strongly agree | Average |
|---|-------------------|----------|-----------|-------|----------------|---------|
| 1. I liked working with my friends in cooperation very much. | 4.5 | 12.7 | 11.2 | 50.7 | 20.9 | 3.71 |
| 2. My group friends cared about collaborative learning and took it seriously. | 3.0 | 19.4 | 29.9 | 37.3 | 9.7 | 3.31 |
| 3. I could have produced a better work if I had worked individually. | 3.7 | 13.4 | 17.9 | 50.0 | 14.9 | 3.59 |
| 4. Collaborative learning positively impacted my interest in people and my attitude towards them. | 4.5 | 6.7 | 18.7 | 47.8 | 22.4 | 3.77 |
| 5. Since success or failure to be obtained would share by the group members, all of our friends worked well. | 4.5 | 12.7 | 11.2 | 50.7 | 20.9 | 3.71 |
| 6. Personalities, interests and attitudes of all the friends in the group were appreciated. | 3.0 | 19.4 | 29.9 | 37.3 | 9.7 | 3.31 |
| 7. Personality was reflected on the study we conducted in collaborative learning approach. | 3.7 | 13.4 | 17.9 | 50.0 | 14.9 | 3.59 |
| 8. I want to take part in this kind of a learning activity again. | 4.5 | 6.7 | 18.7 | 47.8 | 22.4 | 3.77 |
| 9. I saw that choices of group friends are very influential in this kind of a study. | 4.5 | 12.7 | 11.2 | 50.7 | 20.9 | 3.71 |
| 10. The product we obtained made us forget about the problems we experienced during collaborative learning process. | 3.0 | 19.4 | 29.9 | 37.3 | 9.7 | 3.31 |

It is seen in the Table 3 that collaborative learning has a generally positive impact on affective behaviors; pre-service mathematics teachers hesitate about whether or not they could have produced a better work if they had worked individually, and whether or not they would want to take part in such an activity again. Even though this study was a collaborative study, it was observed that some group members had a tendency try to direct the study.

Table 4: Cognitive Impacts of Collaborative Learning Method (%)

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Average |
|--|-------------------|----------|-----------|-------|----------------|---------|
| 1. Togetherness of people with different qualities brought along original products. | 4.5 | 12.7 | 11.2 | 50.7 | 20.9 | 3.71 |
| 2. I went beyond the academic level, which I could reach in the topic we studied individually, by means of collaborative learning. | 3.0 | 19.4 | 29.9 | 37.3 | 9.7 | 3.31 |
| 3. I perceived the stimuli more easily thanks to the collaborative learning. | 3.7 | 13.4 | 17.9 | 50.0 | 14.9 | 3.59 |
| 4. The support given by the group members made it easy for me to perform a particular action. | 4.5 | 6.7 | 18.7 | 47.8 | 22.4 | 3.77 |

It is seen in Table 4 that pre-service mathematics teachers think an original product is created, cooperation of group members facilitates performing the given task, what is demanded is perceived more easily, and an academic level, which could be reached individually, is reached more rapidly with the collaborative learning method. In addition, pre-service mathematics teachers emphasized that this kind of a method will develop their social skills, while the correctness or incorrectness of information will be understood more rapidly and learning is achieved more easily.

Table 5: Behavioral Impacts of Collaborative Learning Method

| | Strongly disagree | Disagree | Undecided | Agree | Strongly agree | Average |
|--|-------------------|----------|-----------|-------|----------------|---------|
| 1. When cooperation is obligatory, better results are obtained. | 7.5 | 10.4 | 20.9 | 33.6 | 27.6 | 3.63 |
| 2. Correctness or incorrectness of information is understood more rapidly via collaborative learning. | 2.2 | 4.5 | 12.7 | 52.2 | 28.4 | 4.00 |
| 3. Evaluation of group study becomes more objective. | 8.2 | 11.2 | 23.1 | 38.1 | 19.4 | 3.49 |
| 4. Information is learnt more rapidly via collaborative learning. | 4.5 | 14.2 | 17.2 | 41.8 | 22.4 | 3.63 |
| 5. Successful students deal with the responsibilities of unsuccessful students. | 9.7 | 14.9 | 25.4 | 25.4 | 24.6 | 3.40 |
| 6. Social skills ((leadership, communication skill, honesty, decision-making, solution of intra-group conflicts, sharing...) are developed directly in collaborative learning. | 0.7 | 3.7 | 7.5 | 52.2 | 35.8 | 4.18 |

It is seen in Table 5 that the pre-service mathematics teachers' stress that when the cooperation of students is obligatory, better results are obtained, correctness or incorrectness of the information is understood more rapidly, evaluation of group study is more objective, and, particularly, social skills are developed directly. However, it was mentioned that successful pre-service mathematics teachers are obliged to deal with the responsibilities of unsuccessful pre-service mathematics teachers in this method. The answers given to the open-ended question "what kind of problems did you have in the process of preparing a plan?" were grouped and coded as follows:

Gathering: They had many problems in gathering outside of the school,

Evasion: Some members in the groups did not work adequately to contribute,

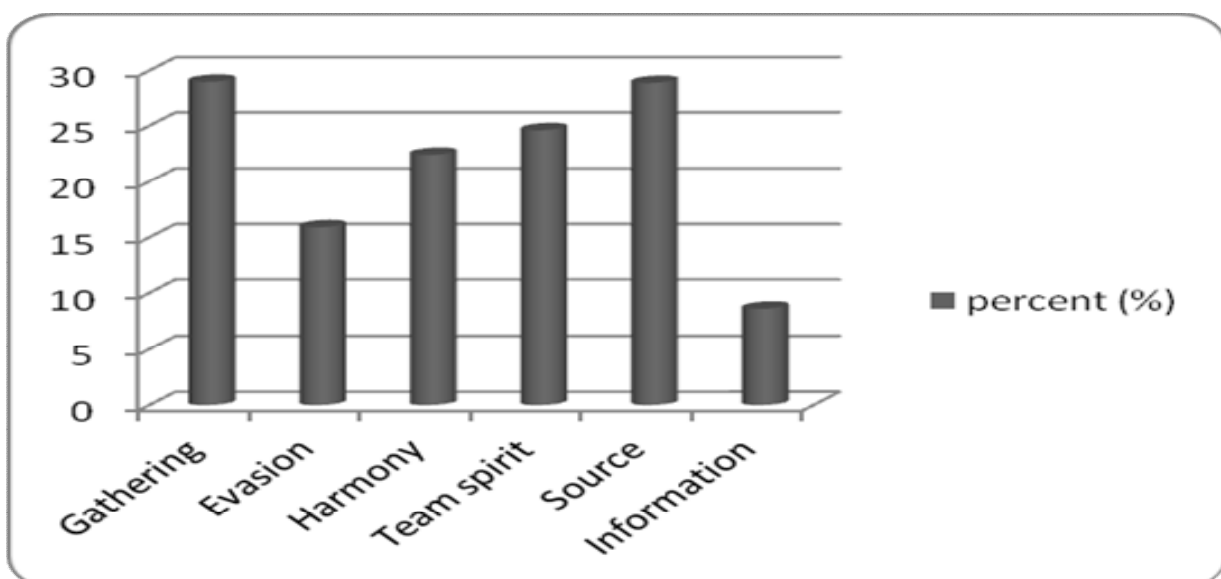
Harmony: Even though the students made up their groups mostly out of the people, with whom they wanted to work, some group members could not adapt to the group academically,

Team spirit: It was realized that friendship relationships are different from job relationships,

Source: They had problems in accessing adequate sources and materials

Information: There was lack of information about the topic as it contributed to the process.

Percentages of data obtained according to the coding are given in Graph 1.



Graph 1: Problems in the Process



According to the result, 41 of the pre-service teachers stress that they are gathering out of the class. Forty of them motion that they do not have enough documents and materials for their class; also, they could not have enough access for sources. Furthermore, thirty-four of the pre-service teachers said they understood that friendship is different from business partnership. In addition, thirty-four of the pre-service teachers mention that they had harmony and adaptation problems with the other group members. Event everyone has different contribution for the team; twenty-two pre-service teachers believe that some of their team member did not have any contribution for their works. Likewise, twelve pre-service teachers stated that they could not contribute because of limited information about topics and difficulties with using technology. On the contrary, fourteen pre-service teachers said they are more familiar to computer as a teaching tool.

CONCLUSION

Collaborative learning is not achieved just by telling individuals to work together by dividing them into the groups. It is not sufficient to make students work in group to discuss with one another and to help one another (Yıldız, 1999). Work and award structures should be heeded, and the study should be structured while arranging group activities in order to apply collaborative learning in real terms. Moreover, teachers using the collaborative learning method should be given training to apply this method more efficiently and purposefully (Slavin, 1996; Yıldız, 1999; Veenman et al., 2002; Doymuş, Şimşek, Bayrakçeken, 2004; Grabichler-Balogh, 2004; Tok, 2008; Uzunboylu and Özdamlı, 2008). As mentioned by Aronson (2000), students' skills in preparing and using materials increase via the collaborative learning method (as cited in Artut and Tarım, 2002). In addition, it was observed that group members help their friends with low success levels in order for their groups to be successful, and students with low success levels study more so as not to decrease the group success. However, it was seen that disinterested group members influence the motivation of the group, and, as a result students, experience restlessness in the group. This indicates that choice of group members is of great importance.

Measurements, which will increase the positive impacts of collaborative learning on general aspects of affective behaviors, on the evaluation stage of the cognitive field, on the personalizing stage of the affective stage, and on the creating stage of kinesthetic field, should be taken and conditions should be provided for this in educational institutions (Yeşilyurt, 2009). Groups should be chosen very carefully and particular attention should be given to establishing teams that work well with one another in the collaborative learning model. Interviews should be made with the groups periodically within the process, and interventions should be made if there are any problems..

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