The effect of cooperative learning on mathematics anxiety and help seeking behavior

Masoud Gholamali Lavasani a, Farah Khandan a

*Department of Educational Psychology and Counselling, University of Tehran, Tehran, Iran

Abstract

Present project is surveying effectiveness of cooperative learning over mathematics anxiety and help seeking behaviour of first grade of high school girls students. Experimental research method was pretest - posttest type which lasted for 8 meetings. For measurement of variables has been used from mathematics anxiety questionnaire and help seeking questionnaire (acceptance and avoidance from help seeking). In respect of executing project plan in pretest level and after execution of two questionnaires, based on highest mark of mathematics anxiety, 40 students from two schools have been selected randomly matching and were put at two groups of control and experimental. Teaching some subjects from math book at control group in traditional way and in exam group has been in cooperative learning method. After termination of educational meetings, again two questionnaires of mathematics anxiety and help seeking behaviour performed over some persons. For data analysis has been used from analysis of covariance (ANCOVA). Consequently results showed that cooperative learning method in comparative with traditional way, decrease mathematics anxiety in students significantly and increase help seeking behaviour and decrease its avoidance component (p<0.05) at them.

Keywords: cooperative learning; mathematics anxiety; help seeking;
1 highlights the social nature of learning whereby children, through interaction with adults and more competent peers, start learning. Principle 2 mirrors Zone of Proximal Development. Principle 3 is cognitive training and deals with processes by which a learner gradually acquires competency through interaction with a skilled person (an adult or an older and more skilled peer). Principle 4 addresses supportive learning. Vygotsky attaches great importance to supportive learning in modern constructivist thinking. In respect to such ideology, students must be given cumbersome and realistic assignments and be provided with support to solve these assignments. Kagan (1991) proposed the four key elements of positive interdependency, individual accountability, equal partnership and interaction. Also in his assumption of cooperative learning, Slavin (1991) outlined the three features of group reward, equal opportunities to achieve success in academic subjects and individual responsibility for one’s own learning and that of others. Various viewpoints have been suggested in setting up groups on such variables as ethnicity, language, culture, abilities, academic achievement and emotional relationships. In Slavin’s (1987) view, the group size is from two to four in which there are an accomplished student, a weak student and the rest are average. Studies in cooperative learning point out that the efficacy of this approach outweighs that of traditional approaches (Sharan, 1980; Slavin 1980). Additionally, this approach has prompted more positive behaviours with respect to school, promoted interest in school and discussion topics and has helped to boost self-confidence and self-esteem in students (Sharan, 1980). The research results suggest that cooperative learning augments trust and mutual respect, decreases anxiety, promotes meta-cognitive knowledge and elevates self-dignity and enthusiasm for learning (Johnson & Johnson, 1989; Millis, 2010; Slavin & Karaweit, 1981). The following are the further outcomes of cooperative learning: more attention and concentration, improving memory, insight, analysis and judgment on scientific knowledge (Johnson & Johnson, 1997). The key factor achievement, in this approach, is a help that each learner offer in order to learn the instructional concepts. Alternatively, Nelson Le-Gall has defined academic help seeking as a strategy to overcome difficulties of learning and to improve competency whereby learners can identify their academic problems try to solve them trough appeal to others. Such help seeking is of numerous benefits to boys and girls at any age and with any levels of ability, ethnicity, and social and classroom background. Help seeking can be considered as an integral part of cooperative learning. In small groups, using other as resources could be an approach to solve problems which relates to cognitive actions, and it could also prompt scientific development and social skills in others (Web, 1980 quoting Nelson Le-Gall, 1981). With respect to the aforementioned points, the present study aims at examining the role of cooperative learning in the amount of math anxiety and help seeking behaviours in female students.

2. Methodology

2.1. Research design

This study is experimental in design through the use of control and experimental group with pretest - posttest.

2.2. Population and Sample

The statistical population in this study was all first grade female students in Karaj public high schools. To select the participants, initially two schools were randomly selected. Afterwards math anxiety and help seeking questionnaires were distributed among all first grade students in the two schools (pre-test). After extracting the data, 20 persons were selected for each of control and experiment groups on the basis of matching method and the highest grade in math anxiety.
2.3. Instruments

The 18-item math anxiety scale measures the two factors of math exam anxiety and math nature anxiety. By measuring Cronbach’s alpha coefficient on 355 students in the initial phase of the study, its reliability was measured 0.93. The questionnaire of help seeking behaviours involves two elements of help seeking acceptance and help seeking avoidance. In order to measure internal consistency of research instruments, Cronbach’s alpha coefficient was measured: 0.69 for help seeking acceptance and 0.63 for help seeking avoidance.

2.4. Procedure

The consent of the selected students for taking part in the pilot study was obtained and a mathematics teacher who taught Mathematics 1 volunteered to teach in both control and experiment groups.

Over a couple of sessions, the teacher and member of experiment group were familiarized with the offering patterns of cooperative learning in together learning and math Olympic methods (In these two methods the teacher writes down some questions on board at the start. Then the questions are examined in the groups. From each group a member goes to the board to provide the answer and the answers are then studied by the teacher. Whenever he figures out that students have problem in a given part, he explains that part or offers a book). After that 8 instructional sessions with both traditional and cooperative methods were held. By the end of the sessions, an examination was given to the two groups on the taught materials. In the last phase, math anxiety and help seeking questionnaires were again distributed as post-test in the two schools.

3. Results

In this study two hypotheses were tested: 1) compared with students who are taught in traditional approach, students who in mathematics are taught in cooperative learning approach have less math anxiety. 2) compared with students who are taught in traditional approach, students who are taught in cooperative learning approach, have more help seeking behaviours and less help seeking avoidance. To test the hypotheses and analyze the data, Single factor ANCOVA was used. Table 1 presents the mean of scores in control and experimental groups in math anxiety, help seeking and help seeking avoidance scales in pre-test and post-test phases:

<table>
<thead>
<tr>
<th>Group</th>
<th>Variables</th>
<th>preanxiety</th>
<th>prehelp</th>
<th>preavoid</th>
<th>postanxiety</th>
<th>posthelp</th>
<th>postavoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>experimental</td>
<td>Mean</td>
<td>44.5000</td>
<td>30.0000</td>
<td>17.6000</td>
<td>16.4500</td>
<td>32.6000</td>
<td>12.9000</td>
</tr>
<tr>
<td>control</td>
<td>Mean</td>
<td>43.8000</td>
<td>27.9000</td>
<td>17.9500</td>
<td>28.6000</td>
<td>28.1500</td>
<td>16.7000</td>
</tr>
<tr>
<td></td>
<td>Std. Deviation</td>
<td>2.39737</td>
<td>5.12887</td>
<td>6.23635</td>
<td>9.52780</td>
<td>3.04830</td>
<td>3.72898</td>
</tr>
</tbody>
</table>

Results in Table 1 suggest that in math anxiety scale of control and experiment group in post-test phase there is a considerable cut compared with the post-test phase. This discrepancy is more evident in experiment group than in control group. Similarly, in help seeking acceptance scale of experiment group compared with control group more increase is evidenced and in help seeking avoidance more decrease is reported. In the next step, to test the research
hypotheses, covariance analysis of collected data in scales of math anxiety, help seeking and avoidance behaviors was examined. The results of covariance analysis test in math anxiety scale are presented in Table 2.

Table 2. analysis of covariance on post test math anxiety as dependent variable

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Observed Powerb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre anxiety group</td>
<td>2.127</td>
<td>1</td>
<td>2.127</td>
<td>.026</td>
<td>.873</td>
<td>.053</td>
</tr>
<tr>
<td>Error</td>
<td>3037.623</td>
<td>37</td>
<td>82.098</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .327 (Adjusted R Squared = .291)

As it is illustrated the effect of the treatment (cooperative learning) on math anxiety with confidence level of 0.95 is significant. Accordingly the means of control and experiment group in math anxiety dependent variable are significantly different. In other words, the first hypothesis, whereby compared with students who are taught in traditional approach, students who in mathematics are taught in cooperative learning approach have less math anxiety, is confirmed. In Table 3 and 4, the results of covariance analysis of help seeking and help avoidance variables are provided.

Table 3. analysis of covariance on post test help seeking as dependent variable

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Observed Powerb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre help seeking group</td>
<td>30.879</td>
<td>1</td>
<td>30.879</td>
<td>4.490</td>
<td>.041</td>
<td>.541</td>
</tr>
<tr>
<td>Error</td>
<td>254.471</td>
<td>37</td>
<td>6.878</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .474 (Adjusted R Squared = .445)

Table 4. analysis of covariance on post test help avoidance as dependent variable

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Observed Powerb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre avoiding group</td>
<td>52.732</td>
<td>1</td>
<td>52.732</td>
<td>4.814</td>
<td>.035</td>
<td>.570</td>
</tr>
<tr>
<td>Error</td>
<td>405.268</td>
<td>37</td>
<td>10.953</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. R Squared = .327 (Adjusted R Squared = .291)

According to Table 3 and 4 the effect of treatment (cooperative learning) on raising help seeking and decreasing help avoidance is significant. Consequently, there is statistically a significant difference between the means of control and experiment in help seeking and help avoidance variables (post-test). In other words, compared with the
traditional approach, cooperative learning was more influential in elevating help seeking behaviors and decreasing avoidance in students. Hence, the second hypothesis is confirmed.

4. Discussion and Conclusion

Covariance analysis in math anxiety scale indicated that the students who are taught in cooperative learning experience less math anxiety compared with students who are taught in traditional method of learning. In a cooperative learning environment the process of learning is more important than the learning product and no one is criticized ignorance for lack of knowledge knowing. Students are not compared with each other and do not compete against each other. In cooperative groups, students are given the opportunity to learn the complicated concepts of mathematics through asking from and appealing to others, thereby raising the confidence in math learning ability reducing math anxiety. Students will experience an atmosphere of peace, tranquillity with no anxiety and fear in such an environment.

Slavin and Karaweit (1981) argue that because the individual is not being criticized in cooperative learning classes, anxiety decreases. In Johnson and Johnson’s (1989) view, lack of competition among the classmates, the reason behind the fact that in cooperative learning anxiety decreases. Stuart (2000) has also reached the similar results in his research. Flower and Rits (1994) and Millis (2010) found that cooperative learning in math class decreases math anxiety. Smith (2007), in a research studying the anxiety an attitude of Mathematics students towards the subject of mathematics, found that math anxiety has significantly decreased in cooperative class. Also in hypothesis 2, single factor covariance analysis in help seeking and help avoidance sub-scales signified the results that compared with the traditional method cooperative learning significantly increases adopting help seeking strategy and decreases the use of help avoidance strategy. Classes managed in cooperative method possess competency structure and through the provision of opportunities for learner interactions foster cooperation, empathy and engagement among them. In pursuit of achieving knowledge, insight and learning, such learners learn how to collaborate with and ask help from others in cooperative groups. Students tackle their learning problems through discussion, consultation and help seeking, provide alternative solutions for solving the problems and learn the various problem solving strategies with the help of the classmates and teacher. It is in this type of learning that the students figure out they cannot fully succeed on their own and need other’s help to solve problems. Slavin (1991) asserts that students, in cooperative learning, learn assistance and cooperation with each other. Cohen (1994) also argues that face to face interaction helps reticent students become active, ask each other and explain the subject matters to each other. Web et al. (quoting Karabenick and Newman, 2006) consider help seeking as planned and constant activity in cooperative learning. It can be deduced from the results of the present study that since cooperative learning decreases math anxiety in a short period of time after carrying out the research, a math teacher can set up cooperative groups in his classroom thus the students by discussing and interacting with each other, decrease math anxiety and learn the subject more enthusiastically. Similarly, the results pointed out that learning in cooperative learning fosters help seeking strategies and discourages help avoidance strategies. Students in cooperative learning have the privilege of seeking help from their teammates in understanding or solving problems. Such an opportunity do not exist in traditional method of teaching and the teacher, in short of time, cannot respond to students’ question on his own. Accordingly on one hand, by forming cooperative groups, teachers can encourage students to seek the help of their group members in order to solve problems and understand subject matters and on the other hand, once in need of others’ help in different occasions learn to enlist the help of them.

References


