

Full Length Research Paper

The investigation of the effects of physical education lessons planned in accordance with cooperative learning approach on secondary school students' problem solving skills

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The purpose of the present research was to investigate the effects of physical education lessons planned in accordance with cooperative learning approach on secondary school students' problem solving skills. The research was conducted on 48 students studying at Konya/Selçuklu Şehit Mustafa Çuhadar Secondary School in fall semester of 2015-2016 school year. The research utilized an experiment (24 students) and a control (24 students) group. In order to investigate the effects of physical education lessons planned in accordance with cooperative learning approach on students' problem solving skills, "Problem Solving Inventory for Primary School Children" developed by Serin et al. (2010) was implemented. Data were analysed on statistics software, using Mann Whitney-U and Wilcoxon Signed Rank tests. According to the findings obtained in the present study, there are not any significant differences between experiment and control groups in terms of pre-test confidence in problem solving skill, self-control, and avoidance and total score averages ($p > 0.05$). There are significant differences between control group pre-test and post-test scores in all dimensions and total scores, in favour of post-test ($p < 0.05$). There are significant differences between experiment group pre-test and post-test scores in all dimensions and total scores, in favour of post-test ($p < 0.05$). There are significant differences between experiment and control groups' post-test scores in all sub-dimensions and total scores ($p < 0.05$). Obtained findings showed that, problem solving skills of the experiment group students, on who cooperative learning approach was conducted, significantly increased more than control group students, on whom traditional methods were conducted, and the difference between these two groups was significant.

Key words: Cooperative learning, problem solving skills, physical education lesson.

INTRODUCTION

Physical education is education intended for developing individuals' physical and mental health and physical

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skills, that is based on flexible rules, which can be changed in accordance with environmental conditions and characteristics of participants if necessary, and conducted through game, gymnastics and sport oriented educative physical activities (Yamaner, 2001; Aracı, 2001; Güneş, 2003; Güllü and Korucu, 2005). Today, physical education lesson is considered as the complement of modern general education that takes individuals in a holistic approach. The objective is making students adopt life-long sporting habits, understand the importance of sport, learn movement skills and develop their physical fitness. In addition, it is considered as the activities intended for physical, psycho-motor, mental, affective and social development (Yenal et al., 1999; Çiçek et al., 2002; Özşaker and Orhun, 2005).

Qualified physical education should attain objectives for students as a result of educational decisions made by teachers (Grineski, 1996). Moreover, physical education should provide students with the opportunities to maintain the active life style during adulthood adopted during childhood and adolescence, besides acquiring knowledge and skills students require for the development (Lee et al., 2007). Besides aiming at developing these mentioned features, a qualified physical education should be organized in a way to provide an environment in which students have equal rights during activities (Kiremitçi and Doğan, 2010). Physical education lessons provide the ideal environment for developing student-centred learning approaches as they provide movement variation (Mosston and Ashworth, 2002). Therefore, the use of cooperative learning by teachers in physical education lessons is considered as an effective way of improving quality (Grineski, 1999).

Cooperative learning has been researched thoroughly since its foundation as a pedagogical strategy in 1970s, and it is presented as an effective classroom implementation. It is one of the most commonly used approaches in active learning (Gillies, 2003; Peterson and Miller, 2004; Tsay and Brady, 2010). Cooperative learning is an approach that is based on cooperation between small groups of students of different characteristics in achieving a certain task and a group task (Dyson et al., 2010). The approach projects the learning of students in a cooperative environment in groups. The most important characteristic of cooperative learning is that students work in groups in accordance with a common objective in small groups by helping in each other's learning. The purpose of cooperation is not being better than one another, but doing better together (Bacanlı, 2005; Açıkgöz, 2005). Cooperative learning includes a procedure during which students try to comprehend the content of the course by working in small heterogeneous groups (Dyson, 2001). Students are responsible for both their own learning and their group mates' learning equally. For the learning to be achieved in cooperative learning, all of the group members should attain the set objective. The main purpose here is

learning how to perform the tasks as a team, rather than performing the task (Slavin, 1996; Johnson et al., 2007). In other words, cooperative learning is the instructional use of small groups that requires cooperation in order to maximize students' own learning, and other students' learning (Johnson et al., 1994). Rozmajzl and Bayer-Alexander (2000) defined cooperative learning as a learning approach that involves small groups formed by students of every level, who are able to work together, to attain a common objective. Cooperative learning is an alternative to traditional teaching approaches, and is conducted to improve the teaching and learning of physical education, and provides active learning by placing the students in the centre of learning (Dyson, 1997; Hendrix, 1999; Dyson and Grineski, 2001). Improving physical education with a new perspective based on students and their learning is of importance. Cooperative learning is considered as an effective way for such development of physical education. If cooperation groups can function effectively, students can learn to learn from each other, exist together, respect each other, and listen to each other (Battistich and Watson, 2007). Forming groups, developing individual responsibility, and improving cooperative skills are basic principles of cooperative learning approach (Grineski, 1996). Students, who participate in physical activities conducted in accordance with cooperative learning approach, learn as they move. They improve their self-realization, entrepreneurship and participating abilities as they learn. Additionally, it is presumed that working in groups can develop problem skills as well.

Problem is defined as a conflict encountered when prevented in attaining the objective (Morgan, 1998). Problem solving is the a cognitive, affective and behavioural process, developed and produced by the individuals to find ways to effectively cope with problematic situations in their daily lives (D'Zurilla and Nezu, 1990). During their lifetimes, individuals encounter many problems, and develop various solutions depending on the problems. Coping with the problems encountered in life, in other words problem solving skills is an important skill that is effective in every part and activity of human life. This skill has an important effect in the process of coping oneself and the environment (Barut and Yılmaz, 2000).

Problem solving skill is a behaviour that is learnt as of childhood and developed during school years (Miller and Nunn, 2001). In today's educational programs, the skills that should be acquired by successful students are defined as establishing communication, scientific, rational and logical thinking, using technology, researching, being productive, and sharing knowledge. Besides these, adopting human values and problem solving skills take place, and problem solving is considered as a skill that should be acquired (Söylemez, 2002). Improving problem solving skills provide students with many individual and social advantages in their future. Therefore, educational

studies should focus on developing problem solving skills, and they should be based on student centred programs that can develop students' social skills, instead of traditional methods (Chen and Cheng, 2009). Accordingly, cooperative learning approach that enables effective learning by placing students in the centre of learning should be set to work. As stated by Riley and Anderson (2006), students are more active in problem oriented brainstorming in classes taught in accordance with cooperative learning.

Research objective

The general purpose of the present research is defining the effects of physical education lessons planned in accordance with cooperative learning approach on secondary school students' problem solving skills. While setting the objective, that mostly some certain approaches and methods are adopted in physical education lessons, and new approaches are not used adequately, which was detected by researches, played a very important role (Donnelly, 2002; Koç, 2005; Yılmaz Saraç et al., 2005; Taşmektepligil et al., 2006; Keske, 2007; Ünlü and Aydos, 2007). Detecting whether cooperative learning, which is based on student centred instruction and eases the learning process, is effective on students' problem solving skills was considered as a necessity. Moreover, it is expected that the findings of the present research will shed light on curriculum development studies for physical education lesson, and further studies on the subject point. In accordance with this general purpose, the problem statement of the present research was set as "Does cooperative learning approach in secondary school physical education lessons have an effect on student' problem skills?" In order to solve this problem, the answers to the following sub-questions are sought:

1. Is there a significant difference between pre-test and post-test results of experiment group students?
2. Is there a significant difference between pre-test and post-test results of control group students?
3. Is there a significant difference between pre-test and post-test average scores of experiment and control group students?

Importance of the research

Cooperative learning approach reinforces the sense of respect to others' skills and talents besides critical thinking skills, confidence and belonging to a group. Additionally, it strengthens relationships, communication and cooperation between students. Many researches have proven that the approach increases student achievement and positive attitudes towards both school and education among students (Rondinaro, 2004;

Sönmez, 2005; Şengören, 2006; Yıldırım et al., 2006; Bozkurt et al., 2008; Ünlü and Aydın, 2011; Arısoy and Tarım, 2013; Genç and Şahin, 2015). Besides these aspects, the effects of cooperative learning approach in physical education lessons on students' problem solving skills should be investigated, because it is important to know the contribution of cooperative learning to problem solving skills.

Literature review presented many studies conducted on the effects of cooperative learning on problem skills in many different disciplines and different levels of education (Genç and Şahin, 2013; Yıldız and Bümen, 2013). There also have been studies on the effects of physical education lessons based on cooperative learning on social skills/problem solving skill (Polvi and Telama, 2000; Dyson, 2001; Dyson, 2002; Tunçel, 2006; Gülay, 2008; Kiremitçi and Doğan, 2010; Altınkök, 2014). However, no studies have been conducted on the effects of cooperative learning approach on the problem solving skills of secondary school senior year students. Accordingly, the use of this approach in secondary school senior year students' physical education lessons is considered to develop students' problem solving skills. This approach is expected to provide physical education with a new perspective, change students' expectations from physical education lessons in a positive way, and provide physical education teachers with new alternatives to be implemented in their fields. Additionally, the findings to be obtained in the present research are expected to shed light on further studies in this field.

METHODOLOGY

Research model

The present is an experimental study conducted to define the effects of physical education lessons based on cooperative learning on secondary school senior year students' problem solving skills. The research was conducted in accordance with "Pre-Test-Post-Test Group Experiment Model", which enables equality between groups based on random selection and also one of the most commonly used models in experimental studies (Cohen and Manian, 1994; Erdoğan, 2003; Karasar, 2011).

Work group

The work group of the present research consists of 48 secondary school senior year students, who studied at Şehit Mustafa Çuhadar Secondary School in Selçuklu central district of the province of Konya in 2015-2016 school year. In order to test the efficiency of cooperative learning in comparison to traditional method, two of the senior year classes were selected randomly, and one of these was assigned as the control group (n=24), and the other as the experiment group (n=24). Cooperative learning based instruction was implemented on the experiment group, while traditional method was adopted in the control group. Before and after the experiment, "Problem Solving Inventory for Children (PSIC)" was implemented on both groups. Experiment duration was planned as 10 weeks, which is considered as an appropriate time for the cooperative learning take effects (Putnam et al., 1996).

Table 1. Mann Whitney U test results for pre-test score averages of groups.

Tests	Groups	N	Mean rank	Rank sum	Mean±SD	U	P
Confidence in problem solving skill	Experiment	24	26.40	633.50	54.91±3.10	242.500	0.345
	Control	24	22.60	542.50	53.33±5.61		
Self-control	Experiment	24	23.81	571.50	10.95±2.36	271.500	0.732
	Control	24	25.19	604.50	11.08±2.93		
Avoidance	Experiment	24	21.75	522.00	8.08±2.51	222.000	0.168
	Control	24	27.25	654.00	8.54±1.53		
General	Experiment	24	24.40	585.50	73.95±4.65	285.500	0.959
	Control	24	24.60	590.50	72.95±7.72		

In order to test whether pre-test averages of experiment and control groups are homogeneous, pre-test Problem Solving Inventory for Children score averages of both groups were analysed with Mann Whitney U test. Findings related to the comparison are shown in Table 1.

As shown in Table 1, there is no statistically significant difference between experiment and control groups' pre-test score averages in "confidence in problem solving skill" sub-dimension ($U=242.500$, $p>0.05$). There is no statistically significant difference in "self-control" sub-dimension ($U=271.500$, $p>0.05$). There is no statistically significant difference in "avoidance" sub-dimension ($U=222.000$, $p>0.05$). There is no statistically significant difference in problem solving total score averages ($U=285.500$, $p>0.05$). Taken mean rank and rank sum values, these results indicate that pre-test scores of experiment group students, on who cooperative approach was implemented, and control group students, on who traditional methods were implemented, were almost at the same levels before the experiment.

Measurement tool

The present research utilized Problem Solving Inventory for Children (PSIC) developed by Serin et al. (2010) in order to evaluate secondary school students' problem solving skills. This inventory consists of three factors as "Confidence in Problem Solving Skill" (12 items), "Self-control" (7 items), and "Avoidance" (5 items), the total of 24 items. Each item is scored on a five-point scale from 1 (I never behave this way) to 5 (I always behave this way). Construct analysis conducted on the 24-item scale showed that the inventory explained 42.26% of the total variance in the inventory. Additionally, confirmatory factor analysis results were in agreement with the three-factor model ($\chi^2/df=2.49$, $RMSEA=0.051$, $GFI=0.92$, $CFI=0.90$). Internal consistency coefficients were calculated as 0.85 for confidence in problem solving skill sub-dimension, 0.78 for self-control sub-dimension, and 0.66 for avoidance sub-dimension. Test-retest reliability scores were 0.84 for confidence in problem solving skill, 0.79 for self-control and 0.70 for avoidance. These scores presenting the problem solving skills are obtained from the total scores obtained from sub-dimensions (Serin et al., 2010).

Data analysis

Data collected for the present research from the data collection tool were analysed on SPSS 20.0 (The Statistical Package for The Social Sciences) with Mann Whitney-U Test, and Wilcoxon Signed

Ranks Test. Mann Whitney-U test is used to test whether scores obtained from two independent groups differ at a significant way, while Wilcoxon Signed Ranks Test is used to test the significance of the difference in scores obtained from two related data sets. In the present research, the significance of the difference between score averages was tested at 0.05 significance level.

Application

Secondary school senior year students studying at the same school were selected as the sample of the present research. Two senior year classes were selected as experiment and control groups randomly. Before the experimental application, Problem Solving Inventory was conducted on these groups as pre-test. The same inventory was also conducted as post-test in order to test the developments in groups, and differences between them after the experimental procedure. In both groups, physical education lessons were carried by the researcher in accordance with physical education curriculum, and the subjects were distributed according to two class hours (40'+40') weekly. The activities conducted during the lessons of these groups included activities intended for the objectives in the physical education curriculum, and activities intended to develop social skills. Physical conditions of the school were examined, the indoor sports hall, free activity hall, and school garden were arranged in accordance with the activities, and necessary security measures. Due to the nature of cooperative learning, what should be done before the application was planned by the researcher. In this planning, objectives related to the acquisition of academic and social skills were set, what students will do during the application was planned, and the materials to be used were presented to students (Dunn and Wilson, 1991; Yıldız, 1999).

At the beginning of the application, groups of 3 students were formed as preparation groups, for students to get used to group work. During two-week preparation period, communication skills and social skills were tried to be given to students through "think-pair-share" based "think-share-do" technique developed by Kagan (1992). The groups tried to find individual solutions for the complex movements presented by the researcher accompanied with music, then they tried to accomplish the task working in groups (Grineski, 1999).

In accordance with the curriculum, the researcher worked on volleyball, table tennis and football branches. The researcher planned the classes including the activities related to the subjects of spike-block and dive for volleyball (2 weeks), forehand, backhand and attack hits in table tennis (3 weeks), and shooting, crossing, and offside rules for football (3 weeks).

The techniques to the implemented during the research were

Table 2. Wilcoxon signed rank test results for experiment group pre-test and post-test scores.

Tests	Group	N	Mean rank	Rank sum	Z	P
Confidence in problem solving skill	Negative rank	0	0.00	0.00	-4.297*	0.000*
	Positive rank	24	12.50	300.00		
	Equal	0	-	-		
Self-control	Negative rank	0	0.00	0.00	-4.291*	0.000*
	Positive rank	24	12.50	300.00		
	Equal	0	-	-		
Avoidance	Negative rank	0	0.00	0.00	-4.290*	0.000*
	Positive rank	24	12.50	300.00		
	Equal	0	-	-		
General	Negative rank	0	0.00	0.00	-4.287*	0.000*
	Positive rank	24	12.50	300.00		
	Equal	0	-	-		

*Based on negative ranks basis ($p < 0.05$).

determined by the researcher in accordance with the objective of the lesson, and the subject to be studied, and physical education activities were adapted to the selected techniques. In volleyball teaching, “mutual teaching” and “mutual interrogation” techniques (Slavin, 1990) were utilized. Basic skills were presented to students by the researcher first, then students conducted learning-teaching in pairs. After that, 4 heterogeneous groups of six were formed, and the pairs in the groups from the previous application performed what they learnt, and the watching pairs provided them with warnings. In the last lesson, “team score” technique (Grineski, 1999) was implemented in game form.

In table tennis teaching, “pair-check-do” technique, which is based on Kagan’s (1992) pair control structure, was implemented. The skill was first explained and performed by the researcher, then cooperation pairs were formed and students learnt the skill in pairs, then the skill was performed again in groups, and after students reinforced the skill in groups, they started studying the next skill.

In football teaching, Slavin’s student teams success parts and Johnson’s “learning teams” (Grineski, 1999), which is based on learning constructs, were implemented. The researcher explained and performed the skill, then checked if students could understand, and performer, audience, feedback provider, and equipment corrector roles were distributed to students in each group, and the performances were evaluated by group members. Both individual and group points were taken into evaluation.

Before starting each activity, the summary of the previous activities were examined from different perspectives by the groups, and tips, feedbacks, corrections and reinforces were provided for both individuals and groups, because in cooperative learning, monitoring of the activities, immediate correction and reinforcing the correct behaviours are of great importance (Demirhan, 2006). The researcher tried that students support each, establish correct bonds with each other and act as a group. Additionally, the researcher acted as a guide during the process of activities to be conducted correctly, and be clear of mistakes. In such situations, the guidance of the teacher and motivating the students is of utmost importance (Senemoğlu, 2009).

In the control group, traditional approach (teaching with instructions, practice) was used. The researcher explained and performed the basic skills in volleyball, table tennis and football first, and the students performed these activities accompanied by the

researcher. Whole lesson processes (start-finish, perform-repeat) were carried out by the researcher, and no student interaction was allowed.

RESULTS

In this part of the research, data related to the sub-problems collected before and after the experiment were analysed with appropriate statistical techniques, and the findings are presented in tables.

In order to test whether there is a significant difference between experiment group students’ pre-test and post-test score averages, experiment groups’ inventory scores before and after the experiment were compared with Wilcoxon Signed Rank Test. The results from the test are shown in Table 2.

As shown in Table 2, there is a statistically significant difference between experiment group students’ pre-test and post-test score averages in “confidence in problem solving skill” sub-dimension ($Z = -4.297$, $p < 0.05$). There is a statistically significant difference “self-control” sub-dimension ($Z = -4.291$, $p < 0.05$). There is a statistically significant difference “avoidance” sub-dimension ($Z = -4.290$, $p < 0.05$). There is also a significant difference in experiment group’s problem solving skill total score ($Z = -4.287$, $p < 0.05$). Taken the mean rank and rank sum values, cooperative learning approach has a significant effect on experiment group students’ problem solving skill.

In order to test whether there are significant differences between control group students’ pre-test and post-test score averages, control groups’ inventory scores before and after the experiment were compared with Wilcoxon Signed Rank Test. The results from the test are shown in

Table 3. Wilcoxon signed rank test results for control group pre-test and post-test scores.

Tests	Group	N	Mean Rank	Rank Sum	Z	P
Confidence in problem solving skill	Negative rank	3	11.17	33.50	-2.074*	0.038
	Positive rank	14	8.54	119.50		
	Equal	7	-	-		
Self-control	Negative rank	1	3.00	3.00	-2.354*	0.019
	Positive rank	8	5.25	42.00		
	Equal	15	-	-		
Avoidance	Negative rank	0	0.00	0.00	-3.898*	0.000
	Positive rank	18	9.50	171.00		
	Equal	6	-	-		
General	Negative rank	2	9.75	19.50	-3.485*	0.000
	Positive rank	20	11.68	233.50		
	Equal	2	0	0		

*Based on negative ranks basis ($p < 0.05$).

Table 4. Mann Whitney-U test results for groups' post-test scores.

Tests	Group	N	Mean rank	Rank sum	Mean±SD	U	P
Confidence in problem solving skill	Experiment	24	36.33	872.00	62.66±2.51	4.000	0.000*
	Control	24	12.67	304.00	54.00±5.38		
Self-control	Experiment	24	34.67	832.00	23.41±6.08	44.000	0.000*
	Control	24	14.33	344.00	12.45±3.92		
Avoidance	Experiment	24	35.46	851.00	18.08±4.79	25.000	0.000*
	Control	24	13.54	325.00	9.58±1.61		
General	Experiment	24	36.38	873.00	104.16±8.67	3.000	0.000*
	Control	24	12.63	303.00	76.04±8.17		

* $p < 0.05$

Table 3. According to Table 3, there is a statistically significant difference between control group students' pre-test and post-test score averages in "confidence in problem solving skill" sub-dimension ($Z = -2.074$, $p < 0.05$). There is a statistically significant difference "self-control" sub-dimension ($Z = -2.354$, $p < 0.05$). There is a statistically significant difference "avoidance" sub-dimension ($Z = -3.898$, $p < 0.05$). There is a significant difference in control group's problem solving skill total score ($Z = -3.485$, $p < 0.05$). Taken the mean rank and rank sum values, traditional approach has a significant effect on control group students' problem solving skill.

In order to test whether there are significant differences in experiment and control groups' problem solving skill post-test score averages, both groups' Problem Solving

Inventory score averages after the experiment were compared with Mann Whitney U test. Test results are shown in Table 4.

As shown in Table 4, there is a statistically significant difference between experiment and control group students' post-test score averages in favour of experiment group, in "confidence in problem solving skill" sub-dimension ($U = 4.000$, $p < 0.05$). There is a statistically significant difference in "self-control" sub-dimension in favour of experiment group ($U = 44.000$, $p < 0.05$). There is a statistically significant difference in "avoidance" sub-dimension in favour of experiment group ($U = 25.000$, $p < 0.05$). There is a statistically significant difference in problem solving skill total score in favour of experiment group ($U = 3.000$, $p < 0.05$). Considering mean rank and

mean sum values, post-test score averages of experiment group students, on who cooperative learning approach was implemented, higher than post-test score averages of control group students, on who traditional approach was implemented.

DISCUSSION

In this part of the present research, conducted to define the effects of physical education lessons organized in accordance with cooperative learning approach on secondary school students' problem solving skills, obtained findings were discussed and interpreted in accordance with the related literature.

According to the pre-test scores conducted before the experimental procedures, problem solving skill total score of groups were similar, and this similarity was random. This finding indicates that beginning levels of experiment and control groups were almost the same, and sample selection was appropriate.

According to problem solving skill in group pre-test and post-test score comparisons, there are significant differences between pre-test and post-test scores of experiment group students in both test general, and sub-dimensions. This significant increase in problem solving scores of experiment group is considered to be resulted from the cooperative learning approach implemented on these students, because, as stated by Gillies and Haynes (2011), in cooperative groups, students use their communicative skills effectively, share knowledge, and be more tolerant towards their friends. As a result of all these, they develop problem-solving skills. Sevim (2015), who used jigsaw technique of cooperative learning approach on secondary school students in Turkish lesson, found that the technique improved experiment group students' problem solving skills at a significant level.

According to problem solving skill in group pre-test and post-test score comparisons, there are significant differences between pre-test and post-test scores of control group students in both test general, and sub-dimensions. This significant increase in problem solving scores of experiment group is considered to be resulted from the fact that physical education lesson is effective in developing problem solving skills. According to Karabulut and Ulucan (2011), when individuals, who participate in a physical activity, encounter a problem, they try to produce solution through problem solving thinking, and with problem solving thinking they can use their existing skills and abilities purposively. Dyson (1995) suggests that environments, where physical activities take place, are one of the most effective environments for developing problem solving skills especially for primary school students.

As stated earlier, both groups' intra-group problem solving skills improved at a significant level. The increase

in control group students may have resulted from the nature of physical education lesson, since in physical education lessons students get away from the boring classroom atmosphere and are in more interaction with their friends. This provides them with a good opportunity to develop their social skills. On the other hand, the improvement in experiment group must have resulted from the combination of physical education lesson with cooperative learning effect. Students worked in groups in physical education lessons where they felt more comfortable, and as a result their problem solving skills improved significantly. Previous studies (Sutherland, 2002; Perels et al., 2005; Ilgin and Arslan, 2012) have shown that students' problem solving skills can be developed through education. In order to attain that, classes should include activities that develop social skills and the classroom environment should be organized accordingly. In this context, we can claim that physical education lessons provide an effective classroom atmosphere for developing problem solving skills.

Comparison of post-test scores of experiment group students, on who cooperative learning approach was implemented, and control group students, with who traditional methods were used, produced significant differences in both sub-dimension and in general in favour of experiment group students. This finding shows that positive effects of physical education lessons carried out in accordance with cooperative learning on students' problem solving skills. Findings of the previous studies conducted on the subject point are in agreement with the findings of the present research. Kiremitçi and Doğan (2010) studied the effects of dancing education conducted in accordance with the approach on problem solving skills of students, and Altinkök (2014) studied the effects of physical education lessons constructed in accordance with the approach. Both these experimental studies found that cooperative learning approach had positive effects on the development of problem solving skills. Another experimental study in a different field (Genç and Şahin, 2013) used the same construct, and reported that students' problem solving skills improved significantly. Similarly, Yıldız and Bümen (2013) reported that cooperative learning developed problem solving skills. Additionally, in an experimental study, Sevim (2015) compared experiment and control groups' problem solving skills, and obtained findings, which were in favour of experiment group.

Previous researches conducted on the subject point showed that students, on who cooperative learning approach is implemented, use cognitive processes more frequently. With this approach, students can understand-comprehend-summarize what they read more easily, are more motivated, can learn concepts more easily, analyse, are more willing to participate in debates, and gain problem solving skill more easily (Veenman et al., 2000; Quinn, 2002; Walmsley et al., 2003; Güngör and Açıkgöz, 2005). Small learning groups are more effective than

individual learning in realizing meaningful learning and problem solving. Compared to the classical methods, studies intended for cooperation increase more effective reasoning strategies, meta-cognitive skills, and motivation in problem solving with different ideas (Tinzmann et al., 1990; Topsakal, 2010). Studies on physical education have revealed that cooperative learning decreases dependency on the teacher, and negative verbal communication, develops interpersonal skills, enables learning through cooperation and group work, develop listening and criticizing skills, and provides equal trial opportunities. According to the findings, cooperative learning is effective in improving problem solving skills in physical education (Penelope, 1993; Smith, 1996; Smith et al., 1997; Grineski, 1999; Polvi and Telama, 2000; Dyson, 2002; Tunçel, 2006; Gülay, 2008; Kiremitçi and Doğan, 2010; Altınkök, 2014). Cooperative learning provides an environment where students can have a rich interaction in how to reach information for complex and real life problems, how to get, how to analyse, how to organize and how to use this information (Gültekin et al., 2007).

Consequently, cooperative learning contributes to physical education lessons. In this way, students learn cooperation and group work together, and are active being in the centre of learning. Their listening and communication skills improve, and their physical development and problem solving skills are affected in a positive way. The present research was conducted with the assumption that the use of cooperative learning approach in physical education lessons improves secondary school senior year students' problem solving skills. Further studies can be conducted on broader samples of students at different levels of education.

Conflict of Interests

The author have not declared any conflict of interests.

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