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The Effect of Cooperative Learning Model on Academic Learning Time and Acquiring Volleyball Knowledge and Skills *

Elvan Esen Akkaya [1], Ayşe Dilşad Mirzeoğlu [2]

Abstract

In this study, it was aimed to examine the effect of cooperative learning model on academic learning time and acquiring volleyball knowledge and skills in secondary school physical education and sports lessons. A quasi-experimental study design including pre-test and post-test with a control group was used in the study. The study was carried out with 8th graders of a secondary school located in a city in the Western Blacksea Region of Turkey. The lessons were taught with team-game-tournament, which is one of the cooperative learning techniques, in the experimental group and with direct instruction model in the control group for 8 weeks throughout the study. Students' academic learning times were obtained by academic learning systematic observation tool in physical education; their volleyball knowledge levels were determined by volleyball knowledge test and psychomotor skill levels were obtained by using skill observation forms. Ratios, frequencies, independent samples t test, one way variance of analysis for repeated measures and ANCOVA statistical methods were used to analyze study data. The results of the study showed that the ratio of academic learning time was 30.86% in the experimental group and 17.12% in the control group; and a statistically significant difference was found favoring experimental group. It was also determined that there was a statistically significant difference in volleyball knowledge test between the groups. Although post test scores were significantly higher in both groups, there was not a statistically significant difference between groups in terms of post-tests. The results of ANCOVA analysis determined that the scores of the students in the experimental group were significantly higher in terms of forearm pass and tennis serve. In conclusion, it can be stated that cooperative learning model is more effective on academic learning time and acquiring volleyball skills in physical education and sports lessons.

Keywords

Academic learning time
Instruction model
Cooperative learning model
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Secondary school

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[1] Dağkent Kıroğlu Education and Health Foundation Secondary School, Türkiye, el_van_elvan@hotmail.com
[2] Sakarya University of Applied Sciences, Faculty of Sport Sciences, Department of Physical Education and Sports Teaching, Türkiye, belcesu@yahoo.com

Introduction

Today, many countries are altering their education systems in order to keep up with the changing characteristics of the individuals. When the studies on this subject are examined, it can be seen that some courses and contents using traditional methods are not as effective as the constructivist approach in the type, level and permanence of students' learning (Pehlivan, 2012) and that practices based on constructivist approach are among the approaches that most affect the educational processes (Arslan, 2007; Çetinkaya, 2023; Çınar, Teyfur, & Teyfur, 2006; Scott, 2011; Silvan, Barbasa, Alves, & Carvalho, 2023). Because students' access to information only from the teacher's explanation or from the book in the learning-teaching processes reflects negatively on their ability to think, interpret and criticize, and causes interruptions in making sense of what they have learned. However, constructivist education approach advocates student's active participation in the learning process and states that learner's access to knowledge is a process that is created internally by itself (Çetinkaya, 2023; Karwasz & Wyborska, 2023; Alqahtani, Yusop, & Halili, 2023). For this reason, in today's world where development and change are very rapid, curriculum development experts and educational researchers have concentrated their studies on problem solving, project-based and collaborative learning, which are teaching methods based on the constructivist approach in order to make education and training practices more qualified (Arifin, Kristiyandaru, Samodra, Santika, & Suryadi, 2023; Arslan, 2007; Fosnot & Peryy, 2007; Lapadat, 2000; Sherman & Kurshan, 2005; Ruzmatovich & G'ayratjon o'g'li, 2023). In Turkey, a gradual transition has been made to educational programs in line with the constructivist learning approach by the Ministry of National Education (MoNE) since 2004 (Çetinkaya, 2023).

By their nature, physical education and sports lessons require active participation of students in course activities. Considering its achievements and content, it is seen that this course contributes to both psychomotor, cognitive and affective development of students (MoNE, 2018). It is seen that physical education teachers generally carry out their lessons with teacher-centered approaches while developing the desired achievements in their students in these areas (Şirinkan & Erciş, 2009; Ünlü & Aydos, 2007). However, considering the changing needs, it is important to diversify the teaching methods used in lessons in order to develop different features among students. For this reason, models and methods that will facilitate the acquisition of features appropriate to the requirements of the age should also be used in physical education and sports lessons besides traditional methods. It is thought that more effective and high-quality course processes will be achieved in physical education and sports lessons by using models and methods appropriate to the course content (Baytur & Ulaş, 2022; Casey & Goodyear, 2015; Darnis & Lucile, 2013; Dyson, Rhodes, Peter, & Hastie, 2010; Sönmez & Mirzeoğlu, 2022). When the studies on this subject are examined, it is seen that the use of models in physical education and sports lesson practices contributes to useful outcomes (Gimenez, Carriedo, & Cecchini, 2023; Zeleznik Mezan, Skof, Leskosek, & Cecic Erpic, 2023; Sönmez & Mirzeoğlu, 2022). In this context, one of the models to be used in lessons is the cooperative learning model offered by the constructivist approach, which is the basis of curriculum in our country.

The cooperative learning model, due to its nature and practice requirements, contributes to the emergence and development of many features in students such as cooperation, collaboration, competition, high-level cognitive thinking, team spirit, group awareness, tactical development, etc. in physical education and sports classes if applied accurately (Güneş & Tösten, 2023; Perdana, Supriatna, Yanti, & Suryadi, 2023; Rocamora, Casey, González-Víllora, & Arias-Palencia, 2023; Turan, Zehir, İlgin, & Soyer, 2023; Zeleznik Mezan et al., 2023). There are many techniques included in the cooperative learning model including student teams-achievement sections, team-supported individualization, separation and reunion, pair-check-practice, cooperative game, think-share-practice and team-game-tournaments. Which technique will be used in cooperative learning processes may vary depending on the content of the course, the characteristics of the student group and the availability of equipment. Although these techniques have their own unique features, the common point where they all intersect is that students work together in groups, contributing to each other's learning and development (Açıkgöz, 2007; Battal ve Bilen 2010; Bayrakçeken, Doymuş, & Doğan, 2013; Yeşilyurt, 2019). One of

these techniques, that is team-game-tournaments, was developed by Slavin (1990). In this technique, students are divided into heterogeneous groups and each group studies the course content with the materials given to them by the teacher. Different students, representing their group, participate in the tournaments held at the end of each course; and in this way, active participation of all students is aimed in the process. At the end of the unit, the first, second and third teams of the tournament are determined by calculating the scores obtained from the tournaments held every week (Altınkök, 2012; Bayrakçeken et al., 2013; Duman, 2011; Yeşilyurt, 2019). The choice of team-game-tournaments technique in the study was influenced by the fact that this technique gamifies teaching and has a tournament at the end where groups compete with each other; because it was not difficult for teachers and students who used these elements in different practices to adapt this technique to the lessons.

There are studies in the literature proving the positive contributions of cooperative learning model to the cognitive (Bjorke & Mordal Moen, 2020; Bodsworth & Goodyear, 2017; Ciocoiu & Tiron, 2020; Darnis & Lucile, 2013; Guzman & Paya, 2020; Luo, Lin, Hsu, Liao, & Kao, 2020) and psychomotor (Callado, 2012; Dyson et al., 2010; Norito, Dlis, Hanif, & Iqbal, 2019; Padillah, Yudiona, & Juliontine, 2020; Pehlivan & Alkan, 2010) development when used in learning-teaching settings. However, it is known that there is a limited number of studies showing how much students show active participation in the practices they are involved in physical education and sports lessons through CLM and how this model affects the cognitive learning level of the students.

The concept of academic learning time (ALT) appears in the literature at the point of determining to what extent the course practices that students attend in physical education and sports lessons are suitable for the content of the course and to what extent they are practiced accurately. ALT is defined as the efficient process during which the student is busy with appropriate and beneficial activities during the class (Metzler, 2005). In other words, increasing the frequency of appropriate motor behaviors associated with course achievements during physical education and sports lesson is associated with academic learning time (ALT-PE). ALT-PE has been investigated by many researchers since it allows to evaluate the quality of education (Ashy, Lee, & Landin, 1988; Beckett, 1989; Metzler, 1990; Silverman, Devillier, & Ramirez, 1991). These studies have generally shown that time to engage in appropriate motor activity has a positive effect on learning. ALT-PE is expected to get increased to high levels for an effective teaching process in physical education and sports lessons (Dudley & Burden, 2019; Hughes & Barney, 2009). In the study by Sau-Ching (1999), it was reported that secondary school students were taught only 1/3 of their physical education and sports lessons within effective learning time. Also, Derri, Emmanouillidou, Vassiliadou, and Kioumourtzoglou (2007) indicated in their study that almost half of the lesson time was allocated to teaching-related warming, management and organizational activities; and a psychomotor learning did not occur within this time.

The most important element of an effective learning process in physical education and sports lessons is the instructional ways used to reach course achievements. Different teaching models and methods used in lessons cause students to participate more in the lesson and spend more time with activities appropriate to the course objectives. It is known that different programs, teaching models or methods used in physical education and sports courses increase academic learning time and the quality of teaching (Cousineau & Luke, 1990; Derri et al., 2007; Dudley & Burden, 2019; Esen & Mirzeoğlu, 2018; Esen-Akkaya, Güneş, & Mirzeoğlu, 2022; Fu, Burns, Yang, Brusseau, & Hannon, 2017; Hein et al., 2015; Mirzeoğlu, Munusturlar, & Çelen, 2014; Munusturlar, Mirzeoğlu, & Mirzeoğlu, 2014; Randall & Imwold, 1989). However, as in the other course disciplines, it is also very important in physical education and sports to choose how the lesson time is spent and the teaching models and methods that have an impact on this, in order for the course contents and achievements to be more effective and permanent. Because determining whether students engage in appropriate activities and practices throughout the learning-teaching processes is important in obtaining accurate results about the effectiveness of the course (Ermamatovich, 2023; Yiğit & Özlü, 2022). At this point, although there are studies revealing the effects of different teaching models on different learning areas in physical education and sports classes (Gonzalez, Santed, Escolano-Perez, & Fernandez-Rio, 2023; Perdana et al.,

2023; Zeleznik Mezan et al., 2023), it has been observed that studies conducted with the cooperative learning model are limited and there are almost no studies revealing the effects of the model on ALT-PE. However, the practical requirements and learning outcomes of this model include behavioral features such as acting together, team spirit, competition and rivalry, personal responsibility, etc. and these are among the basic expectations of physical education and sports lesson practices (Giráldez, Sanmiguel-Rodríguez, Ramos-Álvarez, & Navarro-Patón, 2023; Gonzalez et al., 2023). It is thought that determining the effect of cooperative learning model on students' academic learning time when applied in physical education and sports classes will contribute to both teachers and researchers, as well as to the literature where there are limited number of studies on this subject. In this context, the purpose of this study is to determine the effect of cooperative learning model used in teaching volleyball unit in secondary school physical education and sports classes on academic learning time and students' volleyball knowledge and skill levels.

Method

Study Model

A quasi-experimental design including pre test-post test and control group was used in the study. In this design, two groups are determined with unbiased assignment at the beginning of the study, and one of these groups is the experimental group and the other is the control group. Here, measurements are made in both groups (experimental-control) before and at the end of the study (Karasar, 2003). The pattern and relevant measurements used in the study are given in Table 1.

Table 1. Pre test-post test design with experimental and control groups

Groups	Pre Test	Intervention	Post Test
Group 1 (Experimental)	Volleyball Knowledge Test Forearm Pass Skill Observation Form Overhead Pass Observation Form Tennis Serve Observation Form	Cooperative Learning Model (CLM)	Volleyball Knowledge Test Forearm Pass Skill Observation Form Overhead Pass Observation Form Tennis Serve Observation Form
Group 2 (Control)	Volleyball Knowledge Test Forearm Pass Skill Observation Form Overhead Pass Observation Form Tennis Serve Observation Form	Direct Instruction Model (DIM)	Volleyball Knowledge Test Forearm Pass Skill Observation Form Overhead Pass Observation Form Tennis Serve Observation Form

Experimental Group

This study was carried out in a secondary school located in the central district of a city in the western Blacksea region of Turkey during the fall semester of 2021-2022 academic year. At the beginning of the study, convenience sampling method was used to determine the study groups. The aim of the convenience sampling method is to include everyone who wants to be included in the sample (Ural ve Kılıç, 2011). In the study, a pre-test was applied to determine the volleyball skills and knowledge levels of the students in two eighth-grade classes at the school, and after the equalization process of the groups, these branches formed the experimental and control groups with the unbiased assignment method.

The students in two groups were asked to fill out a volleyball knowledge test at the beginning of the study, and volleyball skills such as overhead pass, forarm pass and tennis serve were video-recorded by one of the researchers for pre-test scores, and the images of these skills were then watched independently by two observers to fill out observation forms for the relevant skill. Skewness and kurtosis values were calculated to determine the normal distribution characteristics of the pre-test scores of the acquired knowledge and skills, and the results are given in Table 2.

Table 2. Pre tests and normality tests for volleyball knowledge test and volleyball skills for Group 1 and Group 2

Measure	Group	n	$\bar{X}$	Sd	Skewness	Kurtosis
Volleyball Knowledge Test	Group 1	14	11,71	3,52	,314	,076
Pre Test	Group 2	14	11,29	4,32	-,927	-,521
Overhead Pass Pre Test	Group 1	14	1,29	,38	,967	-,349
	Group 2	14	1,18	,25	,670	-1,838
Forearm Pass Pre Test	Group 1	14	1,07	,27	3,742	14,000
	Group 2	14	1,07	,18	2,295	3,792
Tennis Serve Pre Test	Group 1	14	1,46	,54	1,036	,112
	Group 2	14	1,46	,69	1,364	,544

As seen in Table 2, statistical analysis revealed that skewness and kurtosis values of the students' cognitive knowledge levels and pre-test scores of overhead pass and tennis serve, which constitute the psychomotor skills, were between -1.5 and +1.5, so it can be said that data show normal statistical distribution (Tabachnick & Fidell, 2013). However, it was determined that skewness and kurtosis values of the forearm passing skill test did not show normal distribution (Bryne, 2010; Kline, 2011).

At the beginning of the study, the skills of the students in groups 1 and 2 were independently scored by two expert observers. Among the observers who made the scores, one was a physical education and sports teacher who was a 3rd level coach in the volleyball branch with a doctorate degree in sports education, and the other was a 2nd level coach in the volleyball branch who was currently an academician in the field of physical education and sports and teaching volleyball at the university. To determine the observer reliability in these skills according to the scores given by the observers, independent groups t-test was conducted for group 1 and group 2 and the results are given in the table below.

Table 3. Interobserver comparison of mean pre test scores of overhead pass, forearm pass and tennis serve skills

Group	Skill	Observer	n	$\bar{X}$	Sd	DF	t	p
Group 1	Overhead Pass	Observer 1	14	1,43	,51	26	1,700	,101
		Observer 2	14	1,14	,36			
	Forearm Pass	Observer 1	14	1,07	,26	26	,000	1,00
		Observer 2	14	1,07	,26			
	Tennis Serve	Observer 1	14	1,57	,76	26	,886	,384
		Observer 2	14	1,36	,50			
Group 2	Overhead Pass	Observer 1	14	1,21	,43	26	,478	,637
		Observer 2	14	1,14	,36			
	Forearm Pass	Observer 1	14	1,07	,26	26	,000	1,00
		Observer 2	14	1,07	,26			
	Tennis Serve	Observer 1	14	1,50	,85	26	,249	,805
		Observer 2	14	1,43	,64			

As seen in Table 3, no significant differences were observed between mean pre test scores of overhead pass ($p>0.05$), forearm pass ($p>0.05$) and tennis serve ($p>0.05$) skills of the students in groups 1 and 2 given by the observers. After it was determined that there was no interobserver difference, the pre-test scores of the students in groups 1 and 2 were created by taking the average of the scores given by the observers, and the two groups were compared with independent groups t-test based on these scores (Table 4).

Table 4. The comparison of pre test scores of the students in groups 1 and 2 regarding volleyball knowledge test and volleyball skills

Measure	Group	n	$\bar{X}$	Sd	DF	t	p
Volleyball Knowledge Test	Group 1	14	11,71	3,52	26	,288	,776
	Group 2	14	11,29	4,32			
Overhead Pass	Group 1	14	1,29	,38	26	,886	,384
	Group 2	14	1,18	,25			
Forearm Pass	Group 1	14	1,07	,27	26	,000	1,00
	Group 2	14	1,07	,19			
Tennis Serve	Group 1	14	1,46	,54	26	,000	1,000
	Group 2	14	1,46	,69			

At the end of the comparison, students in both groups were found to have similar characteristics in terms of volleyball knowledge levels ($t_{(26)}$ =,288, p>0.05), overhead pass ($t_{(26)}$ =,886, p>0.05), forearm pass ($t_{(26)}$ =,000, p>0.05) and tennis serve ($t_{(26)}$ =,000, p>0.05) skills.

After the equivalence of groups was achieved as a result of pre-tests which were applied to the students in both groups on cognitive and psychomotor domains at the beginning of the study, Group 1 (8/A) was assigned as the experimental group where cooperative learning model was used and Group 2 (8/B) was assigned as the control group where direct instruction model (DIM) was used by unbiased assignment method. Experimental group consisted of a total of 14 individuals including 8 male and 6 female students ($\bar{X}$ age=12,85, Sd= 0,53); and control group consisted of 14 participants including 10 male and 4 females ($\bar{X}$ age =12,71, Sd= 0,46).

Data Collection Instruments

In the current study, volleyball knowledge test which was developed by one of the researchers to collect data, observation forms for volleyball skills and "systematic academic learning observation instrument for physical education" which was developed by Parker (1989) were used to collect data.

Volleyball Knowledge Test (VKT): A "Volleyball knowledge test" including 8th grade volleyball subjects was developed to determine knowledge levels of the students regarding volleyball sport. A table of specification was first created for volleyball unit to develop volleyball knowledge test, and this table of specification was checked by a curriculum expert in physical education and sports. Inside this table of specification, there were achievements and subjects which were adapted to the volleyball unit and included within the Official Curriculum of Secondary School Physical Education and Sports Course, prepared by Turkish Ministry of National Education (MoNE, 2018). A single-trial volleyball knowledge test including 75 multiple choice questions with four options based on the cognitive achievements was included in the volleyball unit table of specification. It was paid attention to prepare questions from each subject to be taught in order to ensure content validity of the test. The trial 75-question volleyball knowledge test was sent to a curriculum development and teaching expert, a measurement and assessment expert, a native Turkish expert and four experts in the volleyball field (2 coaches, one teacher and a referee); and their opinions and suggestions were requested. These individuals were asked to provide their opinions about the clarity of the questions, content validity, question roots and distractors. The reliability of the opinions of the experts consulted for the trial volleyball knowledge test was calculated with the formula of Miles and Huberman (1994) and the consistency between the judges was found to be 92.6%. Reliability calculations above 70% are considered reliable for the research (Miles & Huberman, 1994).

Final version of the trial volleyball knowledge test was created by fulfilling the opinions and revisions from the field experts. Then, this trial test was turned into an online test; and high school students (9th and 10th graders) more than 5 times the number of questions (400 individuals) solved the test via whatsapp in september, october and november 2020. It is expected in the item statistics that each item to be included in the test should distinguish the students, who know, from those who do not. In the literature, , it is emphasized that the sample to which the trial test is applied should represent the

main group during the knowledge test development process. The closeness of item statistics retrieved by item analysis and test statistics to be estimated based on them to the statistics obtained from the main intervention group depends on the power of trial group to represent main group (Atılgan et al., 2018; Turgut & Baykul, 2015; Güler, 2017, as cited in Ünlü, 2023). For this reason, the trial form of the test was applied to 9th and 10th grade students who had studied history of volleyball, game rules, field dimensions, etc. in their classes previously.

Item difficulty index and item discrimination power index analyses for each item, that are required to develop the final test from the trial volleyball knowledge test, were performed by using 27% lower and upper group formula. The scores of 75 individuals with the highest score and 75 individuals with the lowest score from the trial volleyball test were taken for calculating item statistics. Item difficulty index and item discrimination power index were calculated on the data obtained from the trial form; and, items with an average difficulty between 0,40 and 0,60 and a discrimination power above 0,40 were identified; and finally, a 25-item final test was generated (Hasançebi, Terzi, & Küçük, 2020). Calculations were made on the final test as a result of the answers given by high school students to these 25 questions; and, final test was determined to have an arithmetic mean of 14, average difficulty of 0,54, standard deviation of 6,9 and a KR-20 coefficient of 0,87. It can be stated that "Volleyball Knowledge Test", which was generated based on this result, is a valid and reliable test for 8th graders.

Volleyball observation forms: Observation forms were created by the researchers for all three skills in order to determine the development of the students in both groups concerning the skills of overhead pass, forearm pass and tennis serve at the beginning and end of the study. Critical behaviors for each skill were identified before the development of observation forms for overhead pass, forearm pass and tennis serve. Relevant literature were reviewed during the identification phase of critical behaviors and opinions of the experts in volleyball field were taken. Necessary revisions and additions were made in the observation forms in line with the expert opinions. Then, separate forms were generated for all three skills to observe and score the criteria of each skill identified. The pattern of scoring in the observation forms developed was as a rating scale: 1 "never observed", 2 "rarely observed", 3 "sometimes observed", 4 "often observed" ve 5 "always observed".

Both pre-tests and post-tests were recorded when observation forms for the relevant skill were used and the skill was measured. Critical behavior in the observation forms was scored independently by the observers. In criterion scoring, a score of "5" point indicates that the behavior was performed with high accuracy and in accordance with the criteria and a score of "1" indicates that the behavior was not applied or applied very inappropriately. There are 6 critical behaviors in the observation forms for the skills of overhead pass and forearm pass. The lowest score that can be taken from these two skills is 1 and the highest is 30. There are a total of 7 critical behaviors in the tennis serve skill observation form and its lowest score is 1 and the highest is 35.

Systematic observation instrument for academic learning time in physical education (ALT-PE): Structured field work observation technique was used to collect data from the students regarding ALT-PE in the study. This technique refers to observing and recording behavior at a pre-determined time or situation. Observed situation is the behavior that the researcher is interested in or has previously decided to observe (Munusturlar, 2011).

Systematic observation instrument for academic learning time in physical education (ALT-PE), which was developed by Parker (1989), was used during the evaluation phase of video recordings. ALT-PE observation instrument is an effective measurement tool that gives information about what course practices are, what students do during the lessons and how much of their class time they participate in the appropriate physical activities (Anderson, 1983, as cited in Munusturlar et al., 2014). Observation instrument has two main domains; these domains have categories and there are subcategories under these categories. One of these domains, the context level is composed of general content, subject matter knowledge and subject matter motor (Parker, 1989; Siendentop, Mand, & Taggart, 1989, as cited in Munusturlar, 2011). Main domains, categories and subcategories included in this observation instrument were given in Figure 1.

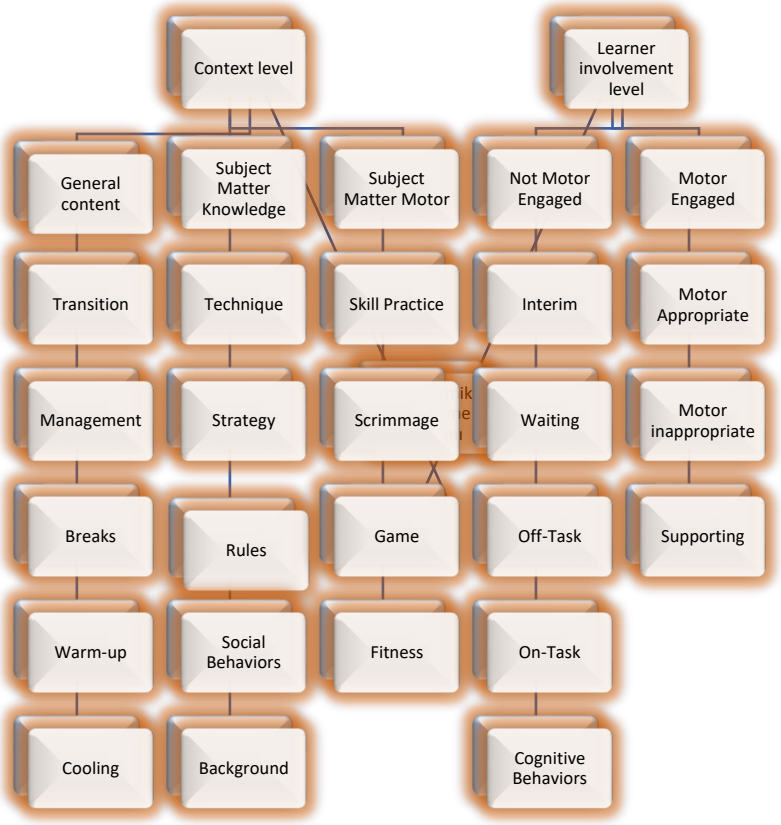

Figure 1. Main Domains, Categories and Subcategories of the Observation Instrument

Interventional process

In the study, the volleyball unit was taught to the students in the experimental group with the cooperative learning model (CLM) and to the control group with the direct instruction model (DIM). The program to be applied in the experimental and control groups, which was prepared based on CLM and DIM, was developed by the researchers and the program was finalized by making the necessary corrections by three academicians who were experts in the field of program development and teaching.

In order for the study to be carried out, firstly an ethics approval was taken from SUBU Ethics Committee (13/10/2020E.9827-26428519/044/) and then an institutional permission was obtained from the Provincial Directorate of National Education (E-39307281-605.01-30850228-03/09/2021) where the study was conducted. Necessary information about the study was given to the administration of the school where the study would be conducted and to the parents of the students who would participate in the study, and necessary permissions were obtained by filling out a parental consent form.

Before taking video images of the students participating in the study, the necessary permissions and documents were obtained from the National Education Directorate (MEM) of the province where the study would be carried out, the school administration where the study would be conducted, and the parents of the students who would participate in the study. During the study, all students in the experimental and control groups were camera-recorded during an 80-minute physical education and sports lesson. Before the practices started, the camera was fixed at a point that could see all the students and the entire field where the practices would take place, and the recordings were made. Video recordings took place for a total of 8 weeks. Pre-test and post-tests of the students were taken for 2 weeks during an 8-week period, and the intervention for the study was carried out during the other 6 weeks. Lesson practices, videos of which were taken every week, were transferred to the computer and stored regularly.

Course process in the experimental group: Students in the experimental group attended course plans and practices which were prepared based on CLM's team-game-tournaments technique prepared by the researchers during their 6-week physical education and sports classes. Following lesson start-up routines (warming, attendance, etc.), students in this group were given a brief information about the knowledge and skills to be covered that week. The students then studied theoretical subject of that week on the worksheets (theoretical and practical) and materials given themselves together with the previously determined tournament teams. Also, they tried to acquire and improve the skill by doing exercises on that week's subject. Teams participated in the practices as helping each other's learning while working on that week's knowledge and skill subjects, and they supported each other. At the same time, they trained their friends who would compete in the tournament on behalf of the team in the knowledge and skill tournaments to be held at the end of the lesson each week. A different student competed on behalf of his team every week according to the course content for 6 weeks. Thus, the possibility of the same students competing in the tournament every week was prevented, and all team members had the opportunity to compete on an equal basis and to support their team. The results of knowledge and skill tournament were written on a cardboard in detail every week; it was hung on a place that could be seen by all the students participated in the practices and stayed there during the week. Thus, groups could follow their progress every week and devised tactics to realize a better performance as a team in the tournament which would be held in the next lesson. At the end of 6 weeks, the scores taken by the teams from knowledge and skill tournaments were summed up and finally, 1st, 2nd and 3rd teams were identified and rewarded. The process in the experimental and control groups in the study is given in Table 5 below.

Table 5. Procedural process followed in the experimental and control groups

Weeks	Experimental Group (Cooperative Learning Model (CLM)	Control Group (Direct Instruction Model (DIM)
Week 1	Pre-test Measures (Volleyball Cognitive Knowledge Test-Overarm, Forearm and Tennis Service Skills Test), Camera Recordings	Pre-test Measures (Volleyball Cognitive Knowledge Test-Overarm, Forearm and Tennis Service Skills Test), Camera Recordings
Week 2	Volleyball Game Rules (Field and Net Dimensions, Team Building, Score, Winning Sets and Matches), Overarm Pass, ALT-Camera Recordings	Volleyball Game Rules (Field and Net Dimensions, Team Building, Score, Winning Sets and Matches), Overarm Pass, ALT-Camera Recordings
Week 3	Volleyball Game Rules (Referees and their Duties, Line up, Rotations), Overarm Pass, ALT-Camera Recordings	Volleyball Game Rules (Referees and their Duties, Line up, Rotations), Overarm Pass, ALT-Camera Recordings
Week 4	Volleyball Game Rules (Player Change, Volleyball Injury, Slam dunk, Plase and Dubbing Concepts), Forearm Pass, ALT-Camera Recordings	Volleyball Game Rules (Player Change, Volleyball Injury, Slam dunk, Plase and Dubbing Concepts), Forearm Pass, ALT-Camera Recordings
Week 5	Volleyball Game Rules (Basic concepts in Volleyball, Playground, Net, Service, Hitting Mistakes), Forearm Pass, ALT-Camera Recordings	Volleyball Game Rules (Basic concepts in Volleyball, Playground, Net, Service, Hitting Mistakes), Forearm Pass, ALT-Camera Recordings
Week 6	Volleyball Game Rules (Serving Rules),Tennis Service, ALT-Camera Recordings	Volleyball Game Rules (Serving Rules),Tennis Service, ALT-Camera Recordings
Week 7	Volleyball Game Rules (Team Building, Breaks, Rotations, Ground information, Service and Service Types), Tennis Service, ALT-Camera Recordings	Volleyball Game Rules (Team Building, Breaks, Rotations, Ground information, Service and Service Types), Tennis Service, ALT-Camera Recordings
Week 8	Post-test Measures (Volleyball Cognitive Knowledge Test, Overarm Pass, Forearm Pass and Tennis Service Skills Post-tests)	Post-test Measures (Volleyball Cognitive Knowledge Test, Overarm Pass, Forearm Pass and Tennis Service Skills Post-tests)

Course process in the control group: In the control group, daily plans that were prepared by the researchers based on DIM were implemented duing 6-week course practices. The students in the control group were given detailed information about the theoretical subjects and skills to be covered in the lessons every week by the teacher using the lecture and question-answer technique. Theoretical knowledge and skills taught by the teacher to the students in the control group every week were similar to the content given to the students in the experimental group. After the teacher explained the skill of that week to the students theoretically in accordance with the criteria, he showed it in detail with the demonstration method. Following these steps, lessons were continued in the control group by running the exercises in the daily plan with the command style. Students performed skill exercises under the supervision of teacher and repeated them continuously. Meanwhile, the teacher gave feedback and corrections to the students who mispracticed the skill or any criteria for its practice. If the incorrect skill practice was continued despite feedback and corrections, the critical points of the skill were reminded, and additional exercises were performed to correct the faulty practice. After concluding that the students could correctly fulfill the criteria for the relevant skill, the students were given independent skill practices that they could do alone or with a partner. While the students were performing independent practices, teacher walked among the students and checked whether the incorrrect skill practices, that he had detected before, were corrected or not.

The lessons were recorded on video by the help of a school staff during the practices for 6 weeks in both groups, and the recordings were transferred to the computer regularly following each lesson. At the end of the study, volleyball knowledge post-test was applied to the 8th graders in the assigned school. Volleyball skills including overarm pass, forearm pass and tennis serve were recorded on video and data obtained were written on the skill forms by the same experts and post-tests were completed. When the study was terminated, video recordings of the lessons taught in the experiment and control groups were used to assess academic learning time.

Data Analysis

Statistical techniques including item difficulty index, item discrimination power index, arithmetic mean, standard deviation, average difficulty of the test and KR-20 reliability coefficient were used while developing the knowledge test for volleyball unit. Independent samples t-test was used to determine observer reliability for volleyball skills in the study. Also, mean pre-test scores of both groups regarding cognitive and psychomotor domains were compared with independent samples t-test. Two-factor analysis of variance for repeated measures (Group: experimental/control*Measures: pretest/posttest) was carried out to compare knowledge levels of the students regarding volleyball. One-factor analysis of covariance (ANCOVA) was used to compare pre-test and post-test scores of overhead pass, forearm pass and tennis serve skills of the students in the experiment and control groups.

The observation technique as watching six seconds and recording six seconds was used to transcribe data recorded to determine ALT-PE of the students in the experimental; and control groups (Parker, 1989). In this study, three students who had motor skill levels different from each other (good-moderate-poor) were initially found in the class before the observer evaluating the video recordings began to assess observations. Then, he coded what student did at that moment on the observation form through watching for six seconds and recording for six seconds (Parker, 1989). During class time, each recorded behavior was multiplied by six seconds; and total category and subcategory times were obtained to calculate ALT-PE.

The recommended way of analyzing ALT-PE data is to make a calculation over the ratios of total observation data. The data associated with ALT-PE were tabulated in the study and frequencies (in seconds) were divided by the total number of observations (total time in seconds) and converted into a percentage for each behavior category. For instance; if we need academic learning time value, all "appropriate motor activity (MA)" observations are calculated and divided by total observation time to obtain the ratio of academic learning time. If requested, this can be applied for all main categories and subcategories included under the main domains of context and learner involvemet. At the end of this calculation, a percent expression can be obtained for each category (Parker, 1989). Percentage

expressions were obtained from the data of each category and subcategory that make up ALT-PE in the study by carrying out data analysis depending on the literature. Each week, three students from the control group (one student with a high participation, one student with a moderate participation and one student with a low participation in the lesson) and three students from the experimental group were chosen from every class; and they were observed by a camera in the study. In other words, a total of 18 students including 3 for both groups per week were observed for a class level. A total of 36 students were observed for two different class levels.

Intra-observer Consistency

All lessons taught in the study were video recorded by the same researcher. The assessments of video recordings were made on the observation form again by the same researcher. In the study, intra-observer consistency was checked on the data regarding ALT-PE obtained from the experimental and control groups. Van Der Mars (1989) has indicated that there are two types of agreement including intra-observer and inter-observer. Intra-observer agreement method was used in this study since the observations and assessments of the video recordings were performed by the same researcher. The assessments of the observations for 36 students selected from 12 lessons of 80 minutes were also made by the same researcher. This researcher re-assessed 2 lessons that he randomly chose from both groups after 8 weeks (from the experimental group and control group at 3rd week) in order to test consistency of the observations. The formula suggested by Miles and Huberman (1994) was used to test the consistency between the assessments made by the assessing researcher and intra-observer consistency rates were determined. As a result of the evaluations, the consistency rates between the observations obtained from the two groups are given in Table 6 below:

Table 6. Intra-observer consistency rates of context and learner involvement domains in the experimental and control groups

Main Domains	**Experimental Group (3rd lesson)**	**Control Group (3rd lesson)**	**Total**
Context	381 / (381+18) x 100= %95.4	383 / (383+9) x 100= %98	764 / (764+27) x 100= %96.6
Learner involvement	337/ (337+18) x 100= %94.9	364/ (364+18) x 100=%95	701 / (701+36) x100= %95.11

At the end of the calculations made, intra-observer consistency was found to be 96,6% for the context domain and 95,11% for learner involvemet domain. Reliability calculations over 70% are considered reliable for research (Miles & Huberman, 1994).

Results

In this study aiming to determine the effect of cooperative learning model on academic learning time and volleyball knowledge and skills of students, the results were given in titles.

Results concerning Academic Learning Time

Table 7. The comparisons of the subcategories of the general content category under context domain between the experimental and control groups

		Experimental Group			Control Group					
Context domain	**Sub categories**	**n**	**$\bar{X}$ (%)**	**Sd**	**n**	**$\bar{X}$ (%)**	**Sd**	**DF**	**t**	**p**
General Content	Transition	6	5,76	2,69	6	3,27	1,45	10	1,996	,074
	Management	6	7,41	2,07	6	16,22	6,00	10	-3,403	**,014***
	Breaks	6	12,81	5,46	6	25,55	8,93	10	-2,983	**,014***
	Warm-up	6	7,14	1,24	6	10,37	14,04	10	-,560	,599
	Cooling	6	2,58	1,49	6	3,54	1,73	10	-1,020	,332
	Total	6	35,69	4,48	6	58,94	9,25	10	-5,539	**,000***

When Table 7 was examined, time allocated for general content category was observed to be 35,69% in the experimental group and 58,94% in the control group. When experimental and control groups were examined for the subcategories of general content, significant differences were found between both groups for management (t(10)=-3,403, p=,014), breaks (t(10)=-2,983, p=,014) and total (t(10)=-5,539, p=,000) in favor of the experimental group.

Table 8. The comparisons of the subcategories of the subject matter knowledge category under context domain between the experimental and control groups

		Experimental Group			Control Group					
Context domain	**Sub categories**	**n**	**$\bar{X}$ (%)**	**Ss**	**n**	**$\bar{X}$ (%)**	**Ss**	**SD**	**t**	**p**
Subject Matter Knowledge	Technique	6	9,57	4,97	6	13,04	9,89	10	-,769	,466
	Strategy	6	11,63	6,94	6	,04	,074	10	4,094	**,009***
	Rules	6	5,85	4,22	6	1,04	1,00	10	2,699	**,022***
	Social Behaviors	6	2,84	3,47	6	,28	,44	10	1,803	,102
	Background	6	---	---	6	---	---	10	----	----
	Total	6	29,87	9,50	6	14,40	9,26	10	2,857	**,017***

When Table 8 was examined, time allocated to subject matter knowledge category was observed to be 29,87% in the experimental group and 14,40% in the control group. When both groups were compared for the time allocated to subject matter knowledge, significant differences were found between both groups for strategy ($t_{(10)}$=4,094,p=,009) and total ($t_{(10)}$=2,857, p=,017) in favor of the experimental group. However, since it is preferred to allocate less time for rules and explanations in an effective physical education lesson, it was determined that there was a significant difference in favor of the control group in the rules subcategory ($t_{(10)}$=2,699, p=,022).

Table 9. The comparisons of the subcategories of the subject matter motor content category under context domain between the experimental and control groups

		Experimental Group			Control Group					
Context domain	**Sub categories**	**n**	**$\bar{X}$ (%)**	**Ss**	**n**	**$\bar{X}$ (%)**	**Ss**	**SD**	**t**	**p**
Subject Matter Motor	Skill Practice	6	33,03	7,91	6	24,78	5,15	10	2,143	,058
	Scrimmage	6	1,42	,685	6	1,89	,752	10	-1,132	,284
	Game	6	,00	,00	6	,00	,00	10	---	---
	Fitness	6	---	---	6	---	---	10	---	---
	Total	6	34,45	7,85	6	26,67	5,23	10	2,022	,071

When Table 9 was examined, time allocated to subject matter motor was observed to be 34,45% in the experimental group and 26,67% in the control group. No statistically significant differences were found between the experimental and control groups in the subcategories comprising subject matter motor content category ($p>0.05$).

Table 10. The comparisons of the subcategories of not motor engaged behaviors category under learner involvement domain between the experimental and control groups

		Experimental Group			Control Group					
Learner involvement	**Sub categories**	**n**	**$\bar{X}$ (%)**	**Ss**	**n**	**$\bar{X}$ (%)**	**Ss**	**SD**	**t**	**p**
Not Motor Engaged Behaviors	Interim	6	2,22	1,01	6	9,18	3,68	10	-4,467	**,001***
	Waiting	6	5,76	1,42	6	12,49	6,26	10	-2,568	**,028***
	Off-Task	6	,918	,83	6	5,76	3,98	10	-2,920	**,015***
	On-Task	6	34,61	8,77	6	33,50	12,03	10	,183	,858
	Cognitive Behaviors	6	12,80	6,02	6	,48	,46	10	5,001	**,001***
	Total	6	56,30	9,16	6	61,39	10,16	10	-,912	,383

When Table 10 was examined, time allocated to not motor engaged behaviors category was observed to be 56,30% in the experimental group and 61,39% in the control group. When the two groups were compared, it was determined that in the control group, significantly more time was allocated in the subcategories of interim ($t_{(10)}$=-4.467, p=.001), waiting ($t_{(10)}$=-2.568, p=.028) and off-task behaviors ($t_{(10)}$=-2.920, p=.015), while in the experimental group, significantly more time was allocated to the subcategory of cognitive behaviors ($t_{(10)}$=-5.001, p=.001).

Table 11. The comparisons of the subcategories of motor engaged behaviors category under learner involvement domain between the experimental and control groups

		Experimental Group			Control Group					
Learner Involvement domain	**Sub categories**	**n**	**$\bar{X}$ (%)**	**Ss**	**n**	**$\bar{X}$ (%)**	**Ss**	**SD**	**t**	**p**
Motor Engaged Behaviors	Motor Appropriate	6	30,86	5,38	6	17,12	5,42	10	4,409	**,001***
	Motor Inappropriate	6	4,26	1,43	6	13,58	4,38	10	-4,964	**,002***
	Motor supporting	6	8,59	4,63	6	7,91	10,98	10	,140	,892
	Total	6	43,70	9,16	6	38,61	10,16	10	,912	,384

As shown in Table 11, time allocated to motor engaged behaviors category was observed to be 43,70% in the experimental group and 38,61% in the control group. When the sub-dimensions of the motor activity behaviors dimension of the experimental and control groups were compared, it was seen that while significantly higher time was allocated to the appropriate motor activity subcategory in the experimental group ($t_{(10)} = 4.409$, $p = .001$), higher time was allocated to the inappropriate motor activity ($t_{(10)} = -4.964$, $p = .002$) subcategory in the control group.

Table 12. Comparison of academic learning times during the courses taught in the experimental and control groups

	Experimental Group			Control Group					
	n	**$\bar{X}$ (%)**	**Ss**	**n**	**$\bar{X}$ (%)**	**Ss**	**SD**	**t**	**p**
Academic Learning Time (ALT)	6	30,86	5,38	6	17,12	5,42	10	4,409	**,001***

The duration allocated to academic learning time during the lesson is the time allocated to motor appropriate subcategory of motor engaged behaviors. As seen in Table 12, 30,86% of class time in the experimental group and 17,12% of class time in the control group were allocated to academic learning time. At the end of the comparison, duration allocated to academic learning time was determined to be higher in the experimental group ($t_{(10)}$=4,409, p=,001).

Results concerning Volleyball Knowledge Test

Table 13. Comparison of mean pre-test and post-test scores of volleyball knowledge test in the experimental and control groups

			Pre Test		Post Test		F	p	n^2
	Group	**n**	**$\bar{X}$**	**Ss**	**$\bar{X}$**	**Ss**			
Group	Experimental	14	11,71	3,52	19,86	3,72	1,574	,221	,057
	Control	14	11,29	4,32	16,79	4,32			
Measure	Experimental	14	11,71	3,52	19,86	3,72	144,019	**,000***	,847
	Control	14	11,29	4,32	16,79	4,32			
Group x Measure	Experimental	14	11,71	3,52	19,86	3,72	5,404	**,028***	,172
	Control	14	11,29	4,32	16,79	4,32			

When Table 13 was examined, a statistically significant difference was found in the mutual effect of the mean pre-test and post-test scores of the students in the experimental and control groups from volleyball knowledge test ($F_{(1\text{-}26)} = 5.404$, $p<0.05$). Similarly, post-test scores of the students were found to be significantly higher when their mean pre-test and post-test scores were compared ($F_{(1\text{-}26)}$=144,019, $p<0.05$). In addition to this, no significant difference was determined between the groups in terms of their mean volleyball knowledge test scores ($F_{(1\text{-}26)}$=1,544, $p<0.05$).

Results concerning Volleyball Skills

Pre-test scores of the students in the experimental and control groups in the skills of overhead pass, forearm pass and tennis serve were taken as a covariate; and ANCOVA test was carried out for these three skills. ANCOVA analysis was performed to check whether significant differences were present between post-test overhead pass, forearm pass and tennis serve scores of experimental and control groups; and its results were given in Table 14, Table 15 and Table 16.

Table 14. The comparison of overhead pass post-test scores of experimental and control groups based on their overhead pre-test scores

	Sum of squares	DF	Mean of squares	F	p	n^2
Corrected model	2,736	2	1,368	1,788	,188	,125
Constant	22,116	1	22,116	28,915	,000	,536
Overhead pass pre-test	1,450	1	1,450	1,896	,181	,070
Group	,830	1	,830	1,085	,308	,042
Error	19,121	25	,765			
Total	607,000	28				
Corrected total	21,857	27				

R^2=0,13, Corrected R^2= 0,06

As seen in Table 14, ANCOVA analysis where pre-test scores were taken as a covariate showed no statistically significant difference between post-test overhead pass scores of experimental and control groups (F= 1,085; p> 0,05).

Table 15. The comparison of forearm pass post-test scores of experimental and control groups based on their forearm pre-test scores

	Sum of squares	DF	Mean of squares	F	p	n^2
Corrected model	6,491	2	3,245	5,431	,011	,303
Constant	11,885	1	11,885	19,890	,000	,443
Forearm pass pre-test	,455	1	,455	,761	,391	,030
Group	6,036	1	6,036	10,101	**,004***	,288
Error	14,938	25	,598			
Total	48,000	28				
Corrected total	21,429	27				

R^2=0,30, Corrected R^2= 0,25

According to ANCOVA analysis where pre-test scores were taken as a covariate, forearm pass post-test scores of experimental groups were found to be higher than the control group (F= 10,101; p< 0,05).

Table 16. The comparison of tennis serve post-test scores of experimental and control groups based on their forearm pre-test scores

	Sum of squares	DF	Mean of squares	F	p	n^2
Corrected model	3,380	2	1,690	4,807	0,17	,278
Constant	60,723	1	60,723	172,716	,000	,874
Tennis serve pre-test	1,371	1	1,371	3,900	,059	,135
Group	2,009	1	2,009	5,714	**,025***	,186
Error	8,789	25	,352			
Total	565,750	28				
Corrected total	12,170	27				

R^2=0,29, Corrected R^2= 0,22

As seen in Table 16, ANCOVA analysis where pre-test scores were taken as a covariate determined that post-test tennis serve scores of the experimental group were significantly higher than the control group (F = 5.714; p < 0.005).

Among the volleyball skills measured in the study, significant differences were found between both groups in overhead pass and tennis serve. The eta square values calculated for the effect size of the resulting difference were examined. Since the values were found to be greater than .14 in both comparisons, the effect size was observed to be at a high level in these two skills (Büyüköztürk, 2014).

Discussion

This study aimed to examine the effect of the cooperative learning model on academic learning time and achieving volleyball knowledge and skills in secondary school physical education and sports classes. Academic learning time consists of two main domains: learner involvement and context. In the current study, academic learning time ratios were found by examining the time ratios of the categories and subcategories under these two main domains. When total time ratios of the subcategories that constitute the general content category of the context domain were examined in the study, time allocated was found to be 35.69% in the experimental group and 58.94% in the control group. According to Parker (1989), the subcategories of this category include starting and ending the lesson, transition between activities, management and resting. The fact that the total time allocated to general content was significantly less in the experimental group than in the control group can be interpreted as that CLM limits the time spent in this stage and causes more time to be allocated to the time required to achieve the objectives of the course. In the study, it was determined that the breaks and management subcategories were found to be higher in the experimental group. Also, time allocated was 25.81% in the control group and 12.81% in the experimental group for breaks subcategory and 7.41% in the experimental group and 16.22% in the control group for management subcategory. One of the indicators of a qualified physical education and sports lesson is that the time allocated to this stage of the lesson is kept to a minimum and students are more involved in appropriate motor activities related to the achievements during the lessons (Mirzeoğlu et al., 2014). The management subcategory in ALT-PE includes the period during which physical activity is not carried out, classroom management is attempted and the teacher warns the students about what they should or should not do in order to maintain lesson order (Parker, 1989). Due to the nature of CLM, students attended classes every week in teams and within predetermined tasks; therefore, the teacher gave fewer instructions to the students before and during the lesson practices. Thus, the percentage of time allocated to the management subcategory decreased. Esen-Akkaya et al. (2022) obtained similar findings in their study where they examined the effect of the individualized teaching model on academic learning time. These findings can be interpreted as an indication that different models used in physical education and sports lessons, other than the direct instruction model that represents the traditional teaching approach, make a positive difference in this regard. When the time ratios of the general content category in similar studies on the subject are examined, it is seen that the percentage of time allocated to this stage varies between 34.67% at minimum and 51.01% at maximum (Derri et al., 2007; Fu et al., 2017; Mirzeoğlu et al., 2014, Munusturlar et al., 2014). In the current study, the cooling subcategory was added to the subcategories belonging to the general content. The time ratios of the added cooling subcategory and general content category increased in both the experimental and control groups accordingly.

In the study, it was determined that the least amount of time was allocated to subject matter knowledge category of the context domain in both groups. This category consists of technique, strategy, rules, social behaviors and background knowledge subcategories (Parker, 1989). In terms of subject matter knowledge, total time ratios allocated were found to be 29.87% in the experimental group and 14.40% in the control group. However, when the studies in the literature on the subject are examined, it is seen that the percentage of time devoted to this category is higher than the studies in the literature. When the relevant literature was examined, it was seen that the proportion of time devoted to this category varied between 9.48% and 23.04% (Derri et al., 2007; Fu et al., 2017; Mirzeoğlu et al., 2014; Munusturlar et al., 2014). The reason why the percentage of time allocated to the subject matter knowledge category in this study is more than the studies in the literature is thought to be the differences in the models and techniques used in the studies. Due to its nature, CLM is a model that is prone to use technique, strategy, rules, etc among the students. In the study, the course contents in the experimental group where CLM was applied were tried to be taught to the students in the same way by using DIM in the control group. It is thought that this may have been the reason why more time was spent on this category compared to the studies in the literature. When the subcategory percentages of both groups in this domain were compared, it was seen that the score of experimental group was higher

in the strategy subcategory, and control group showed a significant difference in the rules subcategory. The findings of the study conducted by Munusturlar et al. (2014) support this result. In this study, time allocated to strategy subcategory was 0.04% in the control group and 11.63% in the experimental group; and the value of this subcategory was higher in the experimental group. In academic learning time, strategy subcategory refers to the time allocated to a plan on how a form of psychomotor skill should be implemented individually or as a group (Parker, 1989). Students in the experimental group constantly developed and implemented different tactics and practices due to the nature of the model during the lessons in order to achieve success in the tournament that would take place at the end of the lesson. For example; students in the experimental group determined which of their friends would best represent their teams in the tournaments testing their volleyball skills and knowledge that would take place that week at the beginning of each lesson. The rule that a different team member will compete every week in the tournaments has led students to implement the idea of determining their friends who participate in the tournament every week and their friends who will compete in the following weeks according to this rule. In addition, students prepared their teammates who would compete in the tournament to be held at the end of each lesson, and each team member undertook a different task in this regard. Active implementation of this process made students in the experimental group to take part in different tactical/technical processes throughout the course practices. During the lessons in the control group where the direct instruction model was applied, the lesson flow was progressed by the teacher. Since there were no competitions or tournaments in which the students could develop tactics during the process, it did not allow for the emergence of any strategic behavior and practice in this process.

When the time ratios of both groups were compared for rules subcategory in the study, it was determined that time allocated was 5.85% in the experimental group and 1.04% in the control group. For an effective physical education and sports lesson, the time spent for rules and instructions is required to be minimum and students are required to engage in more motor activities and behaviors appropriate to the course content (Esen-Akkaya et al., 2022). In this study, since the students in the experimental group took lessons with CLM for the first time and were unfamiliar with the model and lesson practices, the teacher included different rules and explanations (team building, tournament start and end times, transition and durations between task activities, etc.) throughout the lessons. In other words, such a result may have been caused by the introduction of more explanations and instructions to the students by the teacher both in presenting the content related to the course outcomes and in introducing the implementation of the model. However, in the control group where DIM was used, the the students were familiar with this teaching approach and knew the rules of the lesson; and this limited teacher's ability to make too many explanations during the lesson.

Another category of the context domain is the subject matter motor content. In this category, 34.45% of the time was allocated in the experimental group and 26.67% in the control group. When similar studies in the literature were examined, it was seen that time percentages varying between 37.03% and 66.71% were allocated to subject matter motor content category (Derri et al., 2007; Esen-Akkaya et al., 2022; Fu et al., 2017; Mirzeoğlu et al., 2014; Munusturlar et al., 2014; Yıldırım, İnce, Kirazcı, & Çiçek, 2007). The reason of this situation might be that a time period of approximately 10-15 minutes was allocated to tournaments related to the knowledge and skills that constitute the course content at the end of the lesson every week in the team-game-tournaments technique of CLM in the experimental group, and therefore, less time might be allocated to other subcategories that constitute this main category. When the time ratios of subject matter motor content were compared, it was seen that there was no significant difference in any subcategories between two groups. Based on this finding, it can be said that both CLM and DIM led similar time to be allocated to the subcategories of skill practice, scrimmage, game and fitness which constitute subject matter motor content.

The second main domain that constitutes ALT-PE in the study is learner involvement. This main domain consists of two categories: not motor activity engaged behaviors and motor activity engaged behaviors (Parker, 1989). In the study, time allocated to not motor activity engaged behaviors was observed to be 56.30% in the experimental group and 61.39% in the control group. When the relevant literature was examined, it was seen that a percentage of time varying between 60.10% and 85.09% have been devoted to this category (Derri et al., 2007; Munusturlar et al., 2014; Yıldırım et al., 2007). In this current study, it was determined that time allocated to this category in the experimental group where CLM was used was less than the courses taught with different models and methods in the literature. Based on this finding, it can be said that CLM is effective in making students to spend less time in lessons unrelated to the motor skills to be learned in that lesson. This can be considered as an important indicator that increases the quality of the lesson. However, during the lessons in the control group where direct instruction model was applied, it was observed that the time percentages obtained from not motor activity engaged behaviors were at a similar level with the findings of previous studies (Derri et al., 2007; Munusturlar et al., 2014; Yıldırım et al., 2007). When the experimental and control groups were compared in terms of not motor activity engaged behaviors in the study, it was determined that the values of interim, waiting, off-task behaviors and cognitive behaviors categories were higher in the experimental and control groups (Bryne, 2010; Kline, 2011). It was also observed that time allocated to interim and waiting subcategories were 2.22% and 5.76% in the experimental group where lesson was taught with CLM and 9.18% and 12.49% in the control group where DIM was used, respectively. And the score of the experimental group was lower in this subcategory and there was a significant difference. According to academic learning time, interim subcategory expresses the time when the student remains uninterested in the activity during the course practices and behaves in an unrelated manner to the activity and does not perform the activity (Parker, 1989). In the experimental group where CLM was applied, the teacher gave brief information to the students about the course content at the beginning of each lesson and then distributed the worksheets he had prepared in advance. The students carried out the lesson practices after sharing the tasks in working groups of 5 people. According to the technique applied in the study, students have a role within their team throughout the lesson. Students in the teams are aware that their team's success in the tournaments is related to fulfilling their individual tasks in the best possible way. The students in the experimental group became more aware and focused on the importance of accomplishing their duties as the weeks progressed. While one of the team members in the experimental group was practicing for the skill tournament that would take place at the end of the course, another friend helped him to practice by throwing a ball, and another team member gave feedback and correction to his teammates regarding the skill practice criteria from the sideline. Meanwhile, while another student in the team was working on the knowledge tournament to be held at the end of the course, another teammate supported him to get prepared better for the tournament by asking questions. This process proceeded in the same way in three different teams in the experimental group, and students with different tasks had the opportunity to get rest at different times of the lesson. In this way, the students in the experimental group were constantly engaged in the required activity throughout the course, and this made the students in the experimental group to participate more in the course activities and led to less waiting time.

A time ratio of 0.92% was allocated to off-task behaviors subcategory of not motor activity engaged behaviors in the experimental group where CLM was applied, and 5.76% in the control group, and the score of the experimental group in this subcategory was higher and there was a significant difference between both groups. When the relevant literature was examined, it was determined that the percentage of time devoted to the off-task behaviors in the experimental group was similar to the findings in the relevant literature (Fu et al., 2017; Randall & Imwold, 1989; Yıldırım et al., 2007). The off-task behaviors subcategory refers to the time when students exhibit attitudes and behaviors that are not appropriate to the content of the course. The fact that a low percentage of time as 0.92% found in the experimental group proves that students spent less time on undesirable behaviors in CLM practices (Parker, 1989). Group activities, worksheets, knowledge-skill tournaments, etc. that took place among the course activities in the experimental group prevented students from engaging off-task behaviors.

On the other hand, the teacher provided lesson presentations, instructions, explanations and demonstrations in the control group where DIM was used; and these processes caused students to engage in behaviors and practices that are not related to the subject at a high rate. It was observed that 12.80% of the time was devoted to the cognitive behaviors subcategory in the experimental group and 0.48% in the control group, and the score of the experimental group was higher and it was determined that there was a significant difference between both groups. There are studies in the literature that support this finding (Esen & Mirzeoğlu; 2018; Mirzeoğlu et al., 2014; Munusturlar et al., 2014). In the study, the students in the experimental group were divided into teams in each lesson following lesson starting routines, and they had the opportunity to explain, read and ask mutual questions to each other until the end of the lesson, and took part in various cognitive processes with the worksheets prepared by the teacher for their studies. These practices, which were carried out in courses where CLM was used, might have caused an increase in the percentage of time reflecting students' cognitive behaviors.

Motor activity engaged behaviors category consists of three subcategories including appropriate motor activity, inappropriate motor activity and supporting role in motor activity. When the appropriate motor activity behaviors of both groups were compared in terms of time ratios, it was seen that the appropriate motor activity and inappropriate motor activity subcategories were higher in the experimental group and there were significant differences between the experimental and control groups. When the literature on the subject was examined, it was determined that the time ratio of appropriate motor activity in the experimental group was found to be higher than some studies (Derri et al., 2007; Esen & Mirzeoğlu, 2018; Mirzeoğlu et al., 2014; Munustular et al., 2014) and lower than some studies (Esen-Akkaya et al., 2022). Similarly, time ratio of appropriate motor activity in the control group was observed to be higher than some studies (Mirzeoğlu et al., 2014; Munusturlar et al., 2014), and lower than some studies (Esen & Mirzeoğlu, 2018; Esen-Akkaya et al., 2022). The appropriate motor activity refers to time during which the student performs physical activities in a targeted and accurate manner and practices the skills correctly (Parker, 1989). During the lessons where CLM was used, worksheets containing informative visuals and texts about the activities and exercises that the students would perform during the course activities were prepared by the teacher every week and distributed to the students. Therefore, the students in the experimental group had the opportunity to learn and study the skills and knowledge related to the achievements of that week, by receiving support first from the teacher, and then from themselves and from other friends in their team at the end of the lesson. In addition, the course activities drew more attention of the students in the experimental group, since they worked under the guidance of worksheets as well as they participated in a model-based course practice for the first time. Also, they gained more information about the motor activities that were aimed to be learned by involving different sensory organs at the same time during the intervention; and the rate of performing the skill correctly increased. In addition to these, the students in the experimental group provided feedback and correction under the guidance of the worksheet in their teammate's hand while working with their teams, and this enabled student to correct immediately the movement/skill/criteria he/she applied incorrectly and to perform the skill more accurately. These instructional processes resulting from CLM practices may have been effective in increasing the time that students took to participate in appropriate motor activities.

When the time ratios of inappropriate motor activity were compared, it was determined that the score of the experimental group was higher and there was a significant difference between both groups. In the study, it was determined that 4.26% of the time was devoted to the inappropriate motor activity subcategory in the experimental group and 13.53% in the control group. In academic learning time, inappropriate motor activity refers to the time when the student tries to apply appropriate/correct physical activity but cannot perform it correctly (Parker, 1989); therefore, it is desired that the time allocated to this subcategory in physical education and sports classes to be low. When the students in the CLM group practiced volleyball skills, they received immediate feedback and correction from their teammates on how to perform the skill more accurately, and this reduced the probability of performing the skill incorrectly. This caused a lower rate of inappropriate motor activity time compared to control group. In addition, the students in the experimental group were reading the information and important

points about the skill to be learned in order to give feedback/correction to their friends during the lessons; and this might have made them to perform relevant skill more appropriately and accurately during the time they practiced it.

The time allocated to academic learning in physical education and sports classes is achieved by calculating the time ratios allocated to appropriate motor activity under the motor activity engaged behaviors category (Parker, 1989). According to the findings obtained from this study, the percentage of academic learning time in the courses was 30.86% in the experimental group, and 7.12% in the control group. When ALT-PE was compared between the groups, it was determined that the score of experimental group was higher and this created a statistically significant difference. Even though the students in the experimental group participated in a course practice that they had not encountered or practiced before, the students participated in the course practice by helping each other with their teammates during the lessons and provided instant feedback and correction to each other. This fact increased their participation in the lessons and contributed to their participation in appropriate activities at a high level. In addition to this, the awareness of students regarding the tournament that would be held at the end of the lesson every week may have increased their attention to the exercises and studies done in the course, and may have caused them to have more motivation and desire for course activities with the feeling of excitement brought by the feeling of competition. All these learning experiences experienced during the interventions in the experimental group caused the scores to be higher in this group and created a significant difference in terms of academic learning time. This result is also supported by the results of previous studies on the subject (Esen & Mirzeoğlu, 2018; Esen-Akkaya et al., 2022; Fu et al., 2017; Randall & Imwold, 1989).

In this current study, the effect of CLM on achieving volleyball knowledge and skills was also examined in addition to its effect on academic learning time. The findings have shown that there is a significant difference in the mutual effect of the volleyball knowledge test mean pre test-post test scores of the students in the experimental and control groups. Accordingly, the volleyball knowledge levels of the students in both groups were found to be increased in their post-test scores depending on the model whose effects were examined. However, it was also determined that there was no significant difference between volleyball knowledge levels of the students in both groups. In other words, both CLM and DIM improved knowledge such as volleyball gaming rules, field dimensions, technical and tactical knowledge, etc. among the students in a similar way over time. Students in the experimental group had the opportunity to work with the worksheets prepared during the study. The prepared worksheets included visuals supporting the content to be learned besides the information such as game rules of the volleyball branch, field and field dimensions, referee information, volleyball-specific warm-up, etc. In addition, students were asked questions about the subject contents intended to be learned that week in the knowledge tournament planned to be held at the end of the course every week. Thus, while the students in the experimental group participated in the workouts with their teams, they also taught their peers in their teams and sometimes learned from their peers. Additionally, having tournaments at the end of each course may have created a competitive environment between teams and motivated students more to be successful. The fact that students in the experimental group teach their teammates a subject that was also new to them or learning new information from their mates might have increased the permanence of the course content learned that week. When the literature on the subject is examined, it is seen that there are studies supporting this finding (Bjorke & Mordal Moen, 2020; Bodsworth & Goodyear, 2017; Ciocoiu & Tiron, 2020; Darnis & Lucile, 2013; Luo et al., 2020; Gonzalez et al., 2023; Guzman & Paya, 2020; Limbong, 2023; Moura, MacPhail, Graça, & Batista, 2023; Qureshi, Khaskheli, Qureshi, Raza, & Yousufi, 2023; Schulze & Huth, 2022; Troussas, Giannakas, Sgouropoulou, & Voyiatzis, 2023).

When the effects of CLM and DIM on students' learning levels for overhead pass, forearm pass and tennis serve were examined, it was seen that the scores of experimental group were higher and there was a significant difference in the post-test forearm pass and tennis serve scores of the students in both groups, but there was not a significant difference in overhead pass skill between the groups. Based on this finding, it can be said that CLM is more effective than DIM in the development of forearm passing and tennis serve skills among the students. In the experimental group where CLM was used, the first skill that was aimed to be taught to the students was the overhead pass skill. In other words, the weeks when overhead pass starts to be taught are the first two weeks of training. During the overhead pass skill teaching phase, the students in the experimental group met team-game-tournaments technique, which they had not known or practiced before, and started to practice the lesson. In the first two weeks, the students in the experimental group tried to learn the overhead pass skill while trying to adapt to the models and techniques they had just met. For this reason, students may not have been able to focus too much on learning the targeted skill in the first two weeks and may not have been able to complete the exercises effectively. Although this process enhanced overhead passing skills of the students in the experimental group compared to the levels determined at the beginning of the study, it did not create a significant difference compared to the control group. However, as the interventions of CLM continued, the students attending the courses in the experimental group became more familiar with the model and the relevant technique, and adopted this type of learning method. The fact that the experimental group students mastered the rules and tasks of the course activities enabled them to perform relevant task activities better both individually and as a team, and then, they were able to apply the skills to be learned more effectively. Relevant literature include supporting studies (Artanayasa, Suwivwa, & Mashuri, 2023; Callado, 2012; Dyson et al., 2010; Garvi-Medrano, Garcia-Lopez, & Fernández-Río, 2023; Hasbillah, Karim, & Suparman, 2023; Hussein et al., 2023; Jati, Hidayah, & Wahyudi, 2020; Norito et al., 2019; Nurija, Sridana, & Kurniawan, 2023; Padillah et al., 2020; Pehlivan & Alkan, 2010; Perdana et al., 2023; Zeleznik Mezan et al., 2023) as well as unsupporting studies (Luo et al., 2020; Rocamora et al., 2023).

Conclusion, Limitations and Suggestions

In the study, it was determined that cooperative learning model used for learning volleyball unit during physical education and sports lessons at 8th grade of secondary school caused an increase in the academic learning time. In addition, CLM was found to be more effective in acquiring forearm pass and tennis serve skills among the students compared to DIM, and both models provided students with a similar level of learning in terms of volleyball game rules, field dimensions, referee knowledge, technical and tactical knowledge and forearm passing. As a result, it can be said that cooperative learning model in physical education and sports courses is effective in allocating more time to activities related to course outcomes and improving volleyball skills.

Based on the study results, it is recommended that physical education and sports teachers who will use cooperative learning model in their lessons for the first time should conduct in-depth research and preliminary studies on the model and carry out pilot practices regarding the implementation of the model. In addition, in order to use the model effectively, it is recommended to take precautions regarding time management (explanation, application and evaluation) in the course. While creating collaborative groups, teachers should provide opportunities for students to form groups with peers they want to work with in accordance with the principle of positive engagement.

However, some limitations of the study should also be taken into consideration when evaluating the results obtained in the study. The study was conducted only with 8th graders of a secondary school by addressing volleyball unit. Similar studies can be repeated with a higher student participation, considering different grade levels, different school levels and different units. The study was also carried out only with the team-game-tournaments technique of CLM. Different techniques may also be used in future studies. Additionally, this study was conducted in the garden of a school without a gym. It may be recommended to conduct a similar study in a school with a gym which is located in a different sociocultural environment and including a higher number of students.

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