The effect of constructivist environmental group educational games on positive and cooperative self-concept in elementary school

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Abstract

Introduction: The purpose of this study was to investigate the effect of group educational games based on a constructivist learning environment on positive self-concept and cooperative learning in second-grade female students in the second district of Sari.

Methodology: The present study was a semi-experimental study with a pre-test and post-test design. The statistical population consisted of all female students in the second year of elementary school in District 2 of Sari city, which numbered 4000 people. 30 students were selected purposefully and randomly assigned to two experimental and control groups (15 students in each group). To collect data, two self-concept questionnaires were used: The Pierce-Harris (1969) and the Johnson et al. (1999) Collaborative Learning Questionnaire, the validity of which has been confirmed in various studies, and the reliability of the two questionnaires was determined to be 0.78 and 0.88, respectively. Multivariate analysis of covariance was used to analyze the data.

Findings: The results showed that all multivariate tests indicated the significance of the variance of the interaction factor of group and repeated factor (for example, the value of the Pillai effect is 0.72 (F2,30=32.287 P<.01). Considering the effect size of 0.72, it is clear that the effect of group educational game sessions based on a constructivist learning environment on positive self-concept and cooperative learning in second-year elementary school students in the sari district is strong.

Key Words: Group educational games, constructivist learning environment, positive self-concept, cooperative learning

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Introduction

Today, old teaching methods that emphasize the final product (score) rather than the educational process cannot meet the needs of society; therefore, the need for innovation and new educational techniques is felt more than ever before (Theodora et al, 2024). One of the new approaches to learner-centered teaching and learning that has emerged is the constructivist approach (Nasim & Zarrabian, 2020). The constructivist approach leaves teachers free to make decisions that enhance and enrich students' progress in these areas. In the constructivist perspective, learners can analyze, research, collaborate, create, and produce based on what they know, rather than learning facts, skills, and processes rotely (Vafaeifar et al., 2022). Also, using a constructivist approach in teaching leads to a reduction in learners' anxiety and helps them grow in terms of potential related to the lesson and the assessment of their abilities and understanding (Yonyubon et al, 2022; Soloff et al, 2023& Joswick& Hulings, 2023).

The orientation of educational approaches is towards innovation, creativity and knowledge production, and this is one of the characteristics of a suitable teaching method, so that the teaching process is based on the principle of learners' cooperation with the environment and the discovery of facts (Mohammadzadeh et al, 2022). Since collaborative learning is an approach that helps students become more engaged with the material and retain it more, using a new educational method such as constructivism in knowledge and utilizing interactive learning can help develop students' thinking and collaboration skills (Shahmohammadi, 2022). Therefore, by using active teaching methods based on interaction (collaborative), the teacher can train students who will succeed in acquiring the necessary competencies in the current world, because they will face many problems in their daily activities and lives.

Using active teaching methods such as games facilitates students' learning; as if there is a secret hidden in active teaching methods such as games that makes it so enjoyable and pleasant, and makes it a spontaneous activity, learning becomes possible in games (Long Wu, 2023, Vita Barol et al., 2024). Games are one of the basic needs of children and their functions contribute to the comprehensive development of the individual (Navidi and Sheikhian, 2016).

One of the educational problems is the lack of appropriate attractiveness and challenge in the classroom, hence one of the criticisms made of classrooms is the lack of dynamism and lack of motivation of learners. (Mishar and Kessler, 2023) state that traditional classes are often labeled as boring. Also, researchers in the field of educational games believe that learning through play can be much more effective than practice and repetition. Educational games can spontaneously engage children with real-life issues in a way that they can benefit and use in children's communities (Boswa, 2023). Education in the form of games can provide basic learning needs through enjoyment, enthusiastic participation, motivation, social interaction, and creativity (Hughes Roberts, 2023), and educational games can spontaneously engage the child with real-life issues in a way that she can benefit and use in children's communities. (Jasvik and Holling, 2023, Momgan and Alivandi, 1402, Obik-Volvo and Janet C. 2022, Poulin, 2019 and David W. Kreit, 2018) reported in their research that the application of constructivism and constructivist learning perspectives in game design enables learners to be fully engaged in learning activities and gain opportunities for problem solving, self-expression and experiential learning. Therefore, in today's era, given the complexity of societies and the emergence of psychological and behavioral

abnormalities among children and adolescents, the need to address their socialization process and propose correct strategies to strengthen and flourish this phenomenon is felt more than ever (Sanatgar and Esmaili, 2020). Therefore, choosing the appropriate teaching method by the teacher to instill cooperative learning is an important issue, and it is necessary to use appropriate teaching methods to teach it to students (Mohammadi Naeini et al., 2021). In this regard, education in every country should consider this category and aim for the growth, flourishing, and also the ultimate adaptation of children in society and their social development (Ren et al., 2018).

Various factors cause differences in human learning, one of which is the environment. Identifying the factors affecting learning to improve students' performance and academic achievement has been a fundamental goal in most educational research. The strong relationship between a student's acquired outcomes and his perception of the learning environment has been shown by many researchers. Considering the impact of the educational environment on learners' learning, it can be said that identifying classes that are more suitable environments for learning is important, and one of the intervention methods for better learning has always been changing the learning environment (Yenilo Gokurt Ozdemir, 2023). Among them, the classroom environment is the most important determinant of learning in the educational system of learners (Hugh et al., 2020). Various studies have shown that children's participation in group activities and play with peers promotes their social development and has an impact on the social development and intelligence of elementary school children (Rahimi et al, 2020). Self-concept is the way a person evaluates themselves. Children have a simpler self-concept than adults, and a small positive change in it can have a great impact, especially in increasing self-esteem and coping with problems (Shahbeigi and Aini, 2024, Mamghan and Alivandi, 2023). Self-concept is one of the documented dimensions in predicting human behavior and situation, which presents a combination of personality development, motivation, and learning in a unique structure. This structure consists of the perceived self and the self-worth, and the person's task is to make the perceived self as similar or overlapping as possible with the self-worth. Domestic research findings concluded that humanistic education considers self-concept to be an inseparable part of student learning and growth, and they claim that there is a relationship between positive self-concept and learning and academic performance, and they consider the teacher's job to be to provide a suitable environment for students to achieve positive self-concept and appropriate performance (MO Jalal et al, 2023, Hashemi et al, 2022, and Azadi Karvaneh, 2021). Various methods are used to teach positive self-concept, one of the most essential of which is play therapy. The characteristics of the game depend on its application and the conditions of its audience. In other words, these characteristics vary at different age stages and according to the characteristics of the child's development (Hoshina, 2017). Therefore, paying attention to active teaching methods has been essential for designing the curriculum (Vafai Far et al, 2022).

A review of research shows that no research has been conducted so far to investigate the effect of group educational games based on a constructivist learning environment, positive self-concept, and cooperative learning among second-year elementary school students. Considering the importance of better learning in children, the researcher decided to use a new game method based on constructivism to observe its effect on cooperative learning and positive self-concept of the student; therefore, conducting the present study is necessary. Other benefits and important points of this research include: encouraging and preparing teachers to use constructivist games in

teaching, attention from education officials to the determining role of constructivist games in students' learning and their all-round development, and creating a space for using these methods. Therefore, the present study seeks to answer the question: Do group educational games based on a constructivist learning environment have an effect on positive self-concept and cooperative learning in second-grade elementary school students?

Methodology

The present research method is a quasi-experimental type and a pre-test-post-test design was used with a control group and a follow-up phase. The statistical population of the research includes all second-grade elementary school students in District 2 of Sari city in the academic year 1402-1403, totaling 4000 people. It should be noted that in quasi-experimental research, the sample size is limited due to educational intervention and study effectiveness. In this study, 30 students were selected. The reason for choosing this number is the reliability of the sample size and the minimum acceptable sample in quasi-experimental research is 15 people in each group. It should be noted that these 30 people were divided into two groups of 15 people and placed in the control and experimental groups. Also, by considering academic achievement and selecting students with higher performance than expected, students in both groups became equal in terms of academic achievement. The criteria for inclusion in the educational intervention were being female, residing in Sari, not having any clinical psychological illness or disorders such as depression, and having a willingness to cooperate, parents' consent to participate in the study, and participation in all tests and educational sessions. Exclusion criteria were severe physical illnesses including heart and kidney problems, psychological disorders such as depression, inadequate responses to questionnaires, unwillingness to cooperate, and absence from educational sessions. The present scale was developed using the famous Pierre-Harris Children's Self-Concept Scale (1969). This test consists of eighty questions that can be answered with "yes" or "no". This scale consists of fourteen additional questions. This scale is a verbal paper-and-pencil test. These six scales, which are included in the self-concept scale, are considered important in childhood and adolescent psychology.

The names of the subscales are given in Table 1.

Table 1: Six subscales of the self-concept scale

Subscale name	Scale number
Behavior	I
Physical appearance and behaviors	II
Intellectual and educational status	III
anxiety	IV
the fame	V

happiness and satisfaction	*VI*

The scoring method for the self-concept scale is simple. Questions are scored according to the scoring pattern in the direction of high self-concept (adequate). This scale is a common tool for measuring self-concept.

Johnson et al.'s Cooperative Learning Questionnaire (1999) measures five subscales: positive mutual correlation, individual responsibility, group processing, interpersonal skills, and interaction. This questionnaire was used by Mahdavi Nesab and Aliabadi (1939) and the coefficient Cronbach's alpha was estimated at 0.7٤. In the present study, the questionnaire on 30 students, its reliability value was obtained through Cronbach's alpha for cooperative learning of 0.8٢.

In order to prepare a game educational package based on a constructivist environment, first of all, researches and resources in the field of educational games were reviewed and the characteristics of desirable educational games were determined, as well as the components of the learning environment based on Constructivism theory was investigated. The games designed to be implemented in the training of the experimental group were prepared in eight 45-minute sessions. In order to make the educational package more effective, the students were divided into different groups in each session in the form of different games. Then, the desired topics were stated and the children were asked to examine and solve the problem in groups and using the desired tools within 45 minutes. During the students' activity on the problem, the teacher helped the groups as a facilitator and guide and always sought to arouse the interest of the learners and simplify the subject. The details of the educational design and the content of the educational intervention sessions are given in Table 2. Is.

Procedure

To conduct the research, the desired classification was done completely randomly. Before implementing the teaching method based on the constructivist approach, a pre-test (questionnaires of social skills and cooperative learning) was taken from both experimental and control groups, and then the students under the experimental group in a constructivist learning environment as a group They started playing and doing activities. The control group was also trained in the traditional way. After completing the course, a post-test (questionnaires of social skills and cooperative learning) was taken again from both experimental and control groups. This course consisted of 1 session of 40 minutes. It is necessary to explain that the control group was trained in the traditional way during this period. In order to analyze the collected data, first the information obtained from the questionnaires was extracted and arranged in the table of general information, then all the information was analyzed using the computer and through SPSS statistical software in two sections of descriptive statistics (statistical indices of basic variables research) and inferential (multivariate analysis of covariance test) were analyzed.

Table 2: Summary of group educational game sessions based on constructivist learning environment Lesson

EDUCATIONAL GOALS	Knowing the land and water neighbors of Iran. Understanding the concepts of borders and border lines, passports, visas, Iran's relationship with neighboring countries, understanding the issues of Iran and neighboring countries, analyzing border issues
NUMBER OF PLAYERS	۱۵ people
EQUIPMENT	score cards, cards with visa written on them, a selection of Iranian neighbors, a number of balls and a basket, a relatively open and wide place such as a TV hall or prayer hall
NUMBER OF SESSIONS	4
SESSION NUMBE	How to run the game
FIRST SESSION	Exposing the map and explaining the steps of the game Forming groups of 3 to 5 people and playing the game Studying and reviewing maps and educational pamphlets in groups Answering students' questions
SECOND SESSION	Presenting the selection of Iran's neighbors to the group members and completing the selection in the group as a competition Ask questions about the position of neighboring countries and give score cards to correct answers
THIRD SESSION	- Questions about neighboring countries and lesson concepts Playing the game of entry and exit from the country with visa and passport Asking questions about the type of our relations with neighboring countries Drawing Iran's borders with neighboring countries on paper Receiving visas of any country whose image is drawn correctly, receiving the maximum number of points and Passports and visas by group members
FOURTH SESSION	- Mentioning the border issues of Iran and its neighbors, their existence along with the proposal Conducting research on issues between Iran and its neighbors and presenting its results in the classroom Evaluating the performance of the group of members of other groups along with presenting their opinions, if the group's score reaches the quorum, that group is qualified to go to the next round of the game. Placing the baskets written on them is commercial, pilgrimage, cultural and Nowruz custom related to that country. Students are allowed to travel according to the number of passports and visas they have received. Throwing into the wrong basket has negative points
LESSON	The seas around us

GOALS	Knowledge of Oman Sea, Persian Gulf. Getting to know the ocean and the concept of straits and bays. Getting to know the islands of the Persian Gulf. Getting to know the types of fish in the Oman Sea and the Persian Gulf. Familiarity with the importance of protecting the sea, and the types of jobs that deal with the sea, and concepts such as sea and commerce, sea and tourism
NUMBER OF PLAYERS	15 people
EQUIPMENT	Geographical globe, geographical map of Iran, jurchin, fishing hook, paper fish, magnet, clip, chalk or wood, cardboard and paper
NUMBER OF SESSIONS	4 people
SESSION NUMBER	How to run the game
FIFTH MEETING	Putting a geographical globe and game guide in front of the students and forming groups of 3 to 5 people and playing the game Providing information about the Persian Gulf and the Strait of Hormuz, important oil-rich countries, food resources in the sea, export and import, and sea protection. - Studying and reviewing the geographical sphere and the educational pamphlet in a collaborative wa
THE SIXTH SESSION	- Presenting and completing the selection of the country of Iran and the surrounding seas to the members of the groups and playing the game - determining the location of the Oman Sea Persian Gulf, Strait of Hormuz and countries around the Persian Gulf as a competitive game Collecting quizzes and questions about the seas around Iran and awarding score cards to correct answers.
THE SEVENTH SESSION	Making magnets and ribbons for fishing hooks and small fish that use clamps in their mouths and numbers 1 to 150 are written on the back. The fishes are placed on the map in their correct place and the students fish using the hook. Questions from lesson concepts such as: how to protect the sea, valuable marine creatures, occupations of people living in ports, the sea and tourism along with listing the names of occupations that deal with the sea to be pantomimed. Give a score card to the group that answers correctly. Research on why the Persian Gulf has long been the focus of powerful countries.

THE EIGHTH SESSION	- Presenting the research results of the previous session in the class and evaluating the groups from each other (the accuracy of the answers, the type of participation and division of work and the coordination of the group are the criteria for scoring students) Making a model of the Persian Gulf and the Sea of Oman using wood, cardboard, paper, and the like. Any group that makes the work in less time with more creativity and better quality will win and receive a score card. At the end, the number of tasks scored by each group will be counted and finally the winning group will be announced. If two groups have equal points, the groups will be asked questions about the concepts of the lesson and whichever group performs better will be the final winner.

Research Findings

In this section, the descriptive findings of the research variables before and after the sessions of group educational games based on the constructivist learning environment are presented respectively in Table 3.

Table 3: Descriptive indices of research variables (positive self-concept and cooperative learning) before and after the sessions

Variable	Groups / Dimensions		Average before sessions		Average after sessions	
			Average	standard deviation	Average	standard deviation
Positive self-concept	Behavior	the experiment	۱۲/۵۰	٤/۸۰	۱۳/۱۵	٥/۸٦
		Control	۱۲/۸٥	۲/۱۷	۱۳/٤٥	۳/۹۲
	Intellectual and educational status	the experiment	۹/۲٥	٤/۷٥	۱۳/٥۲	٥/۸۰
		Control	۹/۸٥	۲/۱۷	۱۳/٦۱	۳/۹۲
	Physical appearance and behaviors	۱ the experiment	۱۲/٥٥	٤/۷۷	۱۳/۱۹	٤/۲۰
		Control	۱۲/٤٥	۲/۱۷	۱۳/٦٥	٤/٥۲

	anxiety	the experiment	۱۱/۵۱	۳/۷۱	۱۲/۱٦	٤/۹۱
		Control	۱۱/۳۲	۳/۱۸	۱۲/۹۲	٤/۹٥
	the fame	the experiment	۱۱/٤۳	۳/۷۱	۱۳/۳٤	٤/۹۱
		Control	۱۱/٥٤	۳/۱۸	۱۲/۲۳	٤/۹٥
	happiness and satisfaction	the experiment	۱۱/٥٦	۳/٥۱	۱۲/۲٥	٤/۹٥
		Control	۱۱/٥٦	۳/۲۱	۱۳/۷٤	٤/۹۹
Collaborative learning	Positive mutual correlation	the experiment	۱۲/۷۸	۳/۷۱	۱۳/۱۹	٤/۹٥
		Control	۱۲/٦٦	۳/۱۸	۱۳/٤٤	٤/۹٦
	Individual responsibility	the experiment	۱۱/٦۷	۳/۱۹	۱۲/٥٦	٤/۲۱
		Control	۱۱/۸۹	۳/٦۱	۱۲/۸۷	٤/۱۸
	Group processing	the experiment	۱۱/٦۷	۳/۱۹	۱۲/٥٦	٤/۲۱
		Control	۱۲/۸۹	۳/٦۱	۱۳/۸۷	٤/۱۸
	Interpersonal skills	the experiment	۱۲/۷۸	۳/۷۱	۱۳/۱۹	٤/۹٥
		Control	۱۳/٦٦	۳/۱۸	۱۳/۸۸	٤/۹٦
	Interaction	the experiment	۱۱/٦۷	۳/۱۹	۱۲/٥٦	٤/۲۱
		Control	۱۳/۸۹	۳/٦۱	۱۳/۸۷	٤/۱۸

As Table 3 shows, the mean and standard deviation of positive self-concept variables and cooperative learning have increased after the sessions of group educational games based on constructivist learning environment in the experimental and control groups, which shows the effectiveness The sessions of group educational games are based on a constructivist learning environment in the variables of positive self-concept and cooperative learning among the studied groups.

In order to test the hypotheses of the research, the mean scores of the pre-test and post-test of the two experimental and control groups were analyzed through covariance analysis. Before performing analysis of covariance (MANCOVA), the following assumptions were examined. In Table 4, the results of the normality test of the research variables were presented.

Table 4: The results of the normality test of research variable

	KOLMOGOROV - SMIRNOV	
THE DEPENDENT VARIABLES	Kolmogorov-Smirnov test value	Significance level
POSITIVE SELF-CONCEPT (BEFORE)	۰/۸۲	۰/٦۹۹
POSITIVE SELF-CONCEPT (AFTER)	۰/۹۹	۰/۷٤٤
COOPERATIVE LEARNING (BEFORE)	۰/۸٥	۰/۷۳۲
COOPERATIVE LEARNING (NEXT)	۰/۹٥	۰/۷۰۱

According to Table 4, as can be seen in this test, the probability levels (P value) in all research variables are greater than the error level of 0.05. Considering the value of P and not rejecting the null hypothesis, the data distribution is considered to be normal distribution. As a result, parametric tests have been used to test research hypotheses.

In Table 5, the results of the relationship between auxiliary random variables and the dependent variable were presented.

Table 5: The results of the relationship between auxiliary random variables and the dependent variable

Collaborative learning	Positive self-concept		Variable
	۰/٥۷	The correlation coefficient	Positive self-concept
	۰/۰۰۱	Significance level	
۰/٦۲		The correlation coefficient	Collaborative learning
۰/۰۰۰		Significance level	

The results of table (5) show that there is a linear and positive relationship between the dependent variables (before and after the intervention).

In Table 6, the results of the box test were presented to check the assumption of homogeneity of the dispersion matrix.

Table 6: Box test results to check the assumption of homogeneity of the dispersion matrix

Statistical index	Box statistics	statistics F	Degree of freedom 1	Degree of freedom ۲	Significance level
Groups	1/88	0/87	2	0/73	۳۰

According to the value (p = .73, F = 0.87 (2,30), the homogeneity test of the dispersion matrices is not significant.

Table 7: Results of Wilks' Lambda test in multivariate variance analysis of positive self-concept and cooperative learning.

Ita squared	Significance level	The degree of freedom of the effect error	error degrees of freedom	f	Value	Test
.٦٨	.٠٠١	۲	۳۰	۲۸,۲٥٤	۲,۹۰٥	Wilks Lambda

The results of the Wilkes Lambda test show that there is a significant difference between the two groups in at least one of the variables of positive self-concept and cooperative learning.

Lone's test was also used to

check the assumption of equality of variances of dimensions of positive self-concept and cooperative learning in the research groups. In Table 8, the results of Levine's test were presented to check the assumption of equality of variance.

Table 8: The results of Levine's test to check the assumption of equality of variance

significance level	2 degrees of freedom	Degree of freedom 1	Statistics f	Dimensions	Variable
۰/٦٦	۳۰	۲	۰/۳۱	Behavior	Positive self-concept
۰/٦۹	۳۰	۲	۰/۳۳	Intellectual and educational status	
۰/٥٤	۳۰	۲	۰/۳۲	Physical appearance and behaviors	
۰/٥٦	۳۰	۲	۰/٤۱	anxiety	
۰/٦۸	۳۰	۲	۰/٤۹	the fame	
۰/٦۱	۳۰	۲	۰/٥٥	happiness and satisfaction	
۰/٦۱	۳۰	۲	۰/۳۲	Positive mutual correlation	Collaborative learning
۰/٦٥	۳۰	۲	۰/٤٥	Individual responsibility	
۰/۷۱	۳۰	۲	۰/۲٤	Group processing	
۰/۷۲	۳۰	۲	۰/۳۹	Interpersonal skills	
۰/۸۸	۳۰	۲	۰/٤۲	Interaction	

According to table (8), the obtained f is not significant. Therefore, variances are supposed to be equal and covariance implementation is possible.

Discussion and conclusion

The main objective of this study is to determine the effect of group educational games based on a constructivist learning environment on positive self-concept and cooperative learning in second-grade elementary school students in the Do Sari district.

The results of the main hypothesis showed that group educational games based on a constructivist learning environment have a positive and significant effect on positive self-concept and cooperative learning in second-year elementary school students in the Do Sari district. Also, the findings of the first sub-hypothesis showed that group educational games based on a constructivist learning environment have a positive and significant effect on positive self-concept in second-year elementary school students in

the Do Sari district, and the findings of the second sub-hypothesis showed that group educational games based on a constructivist learning environment have a positive and significant effect on cooperative learning in second-year elementary school students in the Do Sari district.

According to the reported results of the multivariate covariance test and the adjusted mean scores, it is clear that all multivariate tests indicate the significance of the variance of the interaction factor of group and repeated factor (for example, the value of the Pillai effect is 0.72, which is (F2,30=32.287 P<.01). Considering the effect size of 0.72, it is clear that the effect of group educational games sessions based on a constructivist learning environment on positive self-concept and cooperative learning in second-year elementary school students in the Do Sari district is strong.

The results of the first sub-hypothesis showed that group educational games based on a constructivist learning environment have a positive and significant effect on positive self-concept in second-year elementary school students in the Do Sari district. In explaining these results, it can be acknowledged that humanistic education considers self-concept to be an inseparable part of student learning and growth, and claims that there is a relationship between positive self-concept and learning and academic performance, and considers the teacher's job to be to provide a suitable environment for students to achieve positive self-concept and appropriate performance. Researchers in the field of educational games believe that learning through play can be much more effective than practice and repetition. Educational games can spontaneously engage children with real-life issues in a way that they can benefit and use in children's communities. Therefore, paying attention to active teaching methods has been essential for designing educational programs. The findings of this hypothesis were consistent with and confirmed by the results of the research of Shahbeigi and Aini (2024), Momghan and Alivandi (2023), Azadi Karma (2022), Hashemi et al. (2021), Jasvik and Holling (2023), Obik-Volvo and Janet C. (2022), Poulin (2019), and David W. Kreit (2018). Also, in explaining this result, it can be said that what makes science and psychological theories more valuable is that they can be put at the service of everyone. We believe that if people see their unwanted suffering in a beautiful way and have a positive and different attitude towards the world and themselves. Ultimately, they are driven towards self-actualization, which is what is expected to create a positive self-concept in them. Thus, it can be concluded that teachers should be able to increase the learning outcomes of learners by developing a favorable learning environment and subsequently making their perception of the learning environment positive; one of these outcomes could be learner motivation.

The results of the second sub-hypothesis showed that group educational games based on a constructivist learning environment have a positive and significant effect on cooperative learning in second-year elementary school students in the Dosari district. By integrating play based on a constructivist environment into their daily instructional design and using cooperative and collaborative learning activities, teachers can accompany students and select activities that are appropriate for their age, and provide conditions for students to interact with each other and engage in more activities through cooperative and collaborative learning, with the help of parents. And they also acquire the skills of communicating with others and processing their actions and tasks. In this regard, and considering the role and importance of play, improving and promoting components such as cooperation and collaboration, self-control and empathy, the age of communications requires the appropriateness and application of modern educational

design patterns and methods. Therefore, educational game design based on a constructivist learning environment can improve skills such as individual responsibility, interpersonal skills, and the ability to interact with others among students (Sanatgar and Esmaili, 2019); they participate in social activities and gain a better understanding of social participation; Therefore, using educational games based on a constructivist learning environment not only helps students' social development, but also facilitates mutual solidarity, bilateral, collaborative, cooperative, and collective engagement of students (Yazdani et al., 2018). In fact, empowering students is the foundation of the constructivist philosophy. For students to become engaged learners, they must be given the opportunity to ask questions and actively explore. Especially if students are constantly encouraged to ask more questions and are praised for asking them, they will ask more effective questions. By asking themselves questions, students become more aware of their own thinking and gain more control over it, as well as the thinking and opinions of others, which is the biggest step towards collaborative learning (Shah-Mohammadi, 2022). Real student-to-student and student-teacher conversations are very important in a constructivist classroom. When both parties listen carefully to each other, an environment is created in which ideas and opinions grow interactively and collaboratively (Vasalu et al., 2017); a constructivist classroom is a student-centered place where meaningful and rich collaboration takes place. Collaborative learning is a flexible and adaptable learning style that allows students to become more independent; in this approach, students can learn more by interacting with each other and ensuring that everyone understands. Students acquire more information through group processing and thoughtful discussions, and they will behave more positively by collaborating with each other about learning (Polin, 2018). In collaborative learning, two or more people try to learn a concept together, investing in each other's resources and skills and collaborating. They use each other for information, evaluate each other's ideas, monitor each other's work, etc. So, in general, collaborative learning occurs when a group of students work together to understand a concept or find a solution to create a product of their learning. Collaborative learning activities can include collaborative writing, group projects, collaborative problem solving, debate, study groups, and other activities. (Vita Barol et al., 2024). Therefore, the results obtained are consistent with the results of the studies of Longwu (2023), Vita Barol et al. (2024), Momghan and Shahmohammadi (2022), Mohammadzadeh and Zare (2021).

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