

# The effect of game-based math education on creativity, social skills and academic self-efficacy of preschool students through Flipped Learning, and model presentation

Alireza Malekshahi, Abdollah Ali Esmaeeli, Ali Asghar Shojaee

**Abstract---** *The present study aimed at the effect of game-based mathematics education on creativity, social skills and academic self-efficacy of preschool students through Flipped learning. The research method was quasi-experimental and applied in terms of purpose. The research plan is pre-test and post-test with the control group. The statistical population consisted of elementary school boys and girls. Among them, a sample with a volume of 40 people was selected by multi-stage cluster random sampling and placed in two experimental and control groups in the form of two classrooms. In both groups, a pre-test was performed, and after the pre-test, the Starmath training was performed for the training group, but the control group did not receive any training, and then the post-test was performed. In this study, the tools of Torrance Form B (1998) and the social skills of Tak and Trend (2014) and the academic self-efficacy of Jings and Morgan (1999) were used. Their reliability with Cronbach's alpha was 0.802, 0.848 and 0.706, respectively. The resulting data were described and analyzed with descriptive and inferential statistics (One Way ANOVA and Paired-Sample T Test). In order to study the research hypotheses; The data were transferred to the raw data pages of the software (Spss 20) for analysis and to the structural equations to SmartPLS software for analysis. Findings from statistical analyzes showed that the effect of Starmath on students' creativity, social skills and academic self-efficacy was positive and significant. Also, the causal model designed in the study was adapted based on the structural equation model. The goodness index of fit and root was the mean of the residual mean in the latent variable model  $RMSEA = 0.074$ . Therefore, the model has a favorable fit and thus the structural equation model of game-based mathematics education has been effective on creativity, social skills and academic self-efficacy of preschool students through Flipped learning. Therefore, with Starmath training, we can increase the skills and abilities of creativity and social skills in learning mathematical concepts and children's self-efficacy.*

**Keywords---** *Self-efficacy, Creativity, Game-Based Mathematics Education, Starmath, Preschool Students.*

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## I. INTRODUCTION

Creativity, social skills and self-efficacy are experiences in school that can have a decisive impact on the present and future lives of children and adolescents. To teach students more deeply, the style of teaching math with Star or Starmath play, which is a completely different style of math teaching, and in this style all the concepts and mathematical operations of preschool to fourth grade are taught to children only through play.

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Alireza Malekshahi, Phd Student in Educational Management, Department of Psychology and Pedagogy Sciences, Islamic Azad University, Babol Branch. Babol, Iran.

Abdollah Ali Esmaeeli, Department of Psychology and Pedagogy Sciences, Islamic Azad University, Babol Branch. Babol, Iran.

Ali Asghar Shojaee, Department of Psychology and Pedagogy Sciences, Islamic Azad University, Babol Branch. Babol, Iran.

The APPEAL curriculum for all began in 1987 by UNESCO with the aim of promoting literacy and learning skills through three programs, namely: eradication of illiteracy (EOI) globalization Primary Education (UPE) and Continuing Education for Development (CED). The concept of the main curriculum was adopted by the Universal Education Declaration for All, which was strengthened and expanded by the Jomene Conference in 1990. This broad perspective on education will help individuals gain survival skills through preschool, introductory, and literacy training . Second, acquiring knowledge and skills to improve their quality of life and attitudes and habits will lead to lifelong learning through continuing education programs (UNESCO, 1993).

Therefore, it is possible to understand any variable that is related to the success of students and can be effective in it; Education has always been important for researchers. Important variables include academic self-efficacy, creativity, and social skills.

Self-efficacy of topics of interest since 1977 entered the field of psychology with an article from Bandura. According to Fischer and Williams (2004), self-efficacy has a special place in the creation, growth and development and individual creativity.

Self-efficacy has been studied in a variety of areas, including behavioral change, job behavior, athletic performance and skill, academic performance and creativity, and the like. In the context of academic performance, self-efficacy, known as academic self-efficacy, refers to the learner's judgment of the ability to achieve educational goals successfully (McGeown, Putwain, Simpson, Boffey, Markham, Vince. 2014). Academic self-efficacy is an important predictor of academic achievement, academic achievement, and academic resilience (Caprara, Vecchione, Alessandri, Gerbino, Barbaranelli, 2011). People with high self-efficacy perform better in setting goals, building strong cognitive mechanisms for acquiring knowledge, coping with academic challenges, and coping with difficult situations (Valentine, DuBois, Cooper, 2004) and are more eager to study (Stubbs and Maynard 2017) Some believe that academic self-efficacy is one of the main factors influencing academic performance (Galla, Wood , Tsukayama , Har, Chiu , Langer , 2014) and lack of self-confidence and low academic self-efficacy. Weakening of learning and other educational activities, especially student research activities (Baltes, Hoffman-Kipp, Lynn, 2010) Feeling weak through negative self-esteem and feelings of helplessness and helplessness led to feelings of depression and anxiety (Muris, 2002). Therefore, academic adjustment is expected to decrease, and as learners' self-efficacy increases, so does their academic adjustment and performance, and to show greater readiness and endurance than those with low self-efficacy.

In addition to self-efficacy, another concept in contemporary educational and cognitive psychology that may affect academic performance is creativity. Creativity is also defined in different ways and from different perspectives. According to Guilford, creativity is the skill and ability to create new and innovative things (Guilford, 1973). Careful review of empirical and theoretical evidence suggests that self-efficacy as effective as a person's confidence in his or her ability to cope with and manage complex situations affects various responses to the experience of academic stressors such as future goals, behavior selection, and dominant motivational patterns (Luzzo, McVarter, Hackett and Bandalus, 1998).

Another variable targeted by the researcher to play was social skills. One of the results of play for children is the acquisition of social skills. Acquiring social skills is a process in which criteria and skills, motivations, attitudes, and social behaviors are formed. Families, peers, and teachers share social skills throughout their careers. Each group exhibits a behavior and the child learns Observational learning (Hettington and Park, 1994). McFaul; He described social skills as special abilities that enable the individual to act skillfully on specific tasks and responsibilities (McFall, 1982). Gresham (1981) considers social skills to be behaviors that maximize the likelihood of receiving reinforcement. Give. In other words, social skills are behaviors that predict important social consequences in certain situations (Gresham and Elliott, 1981).

So far, reviewing the above points shows the impact and connection of these two variables of academic self-efficacy and creativity on each other and on the excellence of students' lives. Various methods have been used to influence these variables, and games can be considered as important and new methods.

The findings of Jarrett's research (1997) show the effect of role-playing in solving mathematical problems. He believes that in play, children can do math on their own, invent, experiment, write with a specific purpose, and play the role of adults. Researchers such as Allen and Ross (1977), Bright et al. (1985), Bahr & Reith (1989), Christensen & Gerber (1990), Okolo (1992), and Malinow and Black (2003) on the role of mathematical and computer learning games. O emphasized on improving children's math performance. Today, this method is called educational entertainment (Lucking et al., 2008). Therefore, it seems that researchers abroad are emphasizing the impact of play on mathematics education.

Various studies show that in the Iranian society, the capabilities of educational games are not used much or are rarely used. Probably a factor as to why they're doing so poorly - and why they're doing so poorly. Despite this, external and very little internal research shows that games are very useful media in improving and promoting learning. Games improve and enhance learning by involving players, or rather learners, in the teaching and learning process.

The importance of playing in the educational system can also be mentioned in preschool. One of the most important educational goals in preschool is to cultivate the five senses. The use of the five senses is based on the process of knowing and recognizing, and recent research findings show that the more a child hears, sees, smells, touches and senses as he or she grows before entering elementary school, that is, in sensitive years, a better understanding of the world. It will have its surroundings, and if the child's feelings and perceptions are strong, it will lead to the further development and expansion of his cognitive development. Also, psychologists and education specialists such as Froebel, Montessori, Piaget and Bruner have concluded that children learn actively through experience and the use of their different senses (Farmani Shojaat, 2010).

On the other hand, teaching professionals are always researching to find new teaching methods in the Teaching and learning environment (Biggs & Tang, 2011) to improve students' learning through these new teaching methods. The Flipped method is one of the new methods that has been proposed recently. In this educational model, direct instructional content is transferred to the outside of the classroom, and the assignments and related activities take place under the supervision of the teacher in the facilitator's position in the classroom (Ojalvo, & Doyne, 2011). Running a reverse class is easy. In this approach, direct instruction is provided through video or other instructional materials that learners use before coming to class. This shift in teaching allows the teacher to use the classroom time for group and individual activities (Bergmann & Sams, 2012).

Numerous studies have shown that if students are significantly involved in their learning and evaluation process, they are also more successful in constructing mental knowledge (Kenna, 2014).

Therefore, in the present study, the researcher intends to pay attention to reverse learning and study the effect of this type of learning on students' creativity, life skills and academic self-efficacy.

In a study aimed at creating game-based classes for learning English, Hung (2018) acknowledged that a classified approach is designed to help teachers and provide classroom activities that can belong to students. Be. The proposed approach combines the benefits of using game-based learning classes with advanced board game technology (TEBG) to enhance student participation. What sets TEBG apart from computer games is the integration of Quick Response Codes (QR) to deliver digital content via mobile technology. The research results show that the proposed approach is useful for English language learners by reducing their anxiety about speaking English in class and increasing their motivation to participate in classroom activities.

Tao, Hung, Hsiu-Ting (2016) are a study aimed at using classes with digital game-based learning activities to teach English to elementary students. This study examines the impact of English education and the motivation of the experimental group on attention, communication, trust and satisfaction. The results show that there is no significant difference between experimental and control groups. However, the experimental group showed great progress in learning progress after game-based learning activities. Examining the experimental response of the experimental group to the classroom, which is known for game-based play, in addition, the study shows that participants believe that this method can create their interests and curiosity in learning, and this game Has prepared them for continuous learning materials. In addition, the results also show that the game-based learning process can enhance your sense of success in learning, thus encouraging them to continue their education.

Matsumoto (2016) has recently become very interested in using game elements for non-game situations. This concept has been used in several different fields, one of which is education. This article suggests using classroom support methods using game elements. In order to discuss the advantages and disadvantages of education, the authors conducted a test and questionnaire using classes canceled with game elements for English as a foreign language teaching. The results of this study are based in particular on the importance of learning, task, interface, and appropriate feedback for game-based e-learning. This is a reverse version of the traditional learning model.

The results of a study by Kim and Chang (2010), who conducted a study entitled "Educational Computer Games" for the mathematical development of different students, showed that students who spoke English and used computer educational games in mathematics, in Comparisons with students who did not use the game performed poorly in math.

Grabowski (2007) has shown that playing is more effective than formal education in improving students' performance in math, and that participatory play is more effective in promoting positive attitudes toward math regardless of individual differences.

Considering the importance of the variables of academic self-efficacy and creativity, the effectiveness of the Flipped learning method considering the previous principles and findings, as well as the role of the game teaching method mentioned so far, in this regard, the present study seeks non-computer games. It includes small tools that can be used in accordance with a standardized program, which, in spite of the effects of the game, considering the benefits mentioned above, can include hand and body movements in line with the researcher's intended learning goals. It is also a delicate muscle activity (Galahu, 2012) and has more physical and motor value than computer games. On the other hand, the researcher's tools have been used to teach mathematics (Jafari and Ali Esmaili, 2017; Keshtgar, Mo'meni Mahmooi, Pakdaman, and Gholami Noghab, 2015; Ali Esmaili and Ranjgar, 2008). Therefore, the researcher of this tool and this course. Has carefully selected the scientific and research background. Therefore, the researcher intends to test how it affects these three important variables and tends to use play as one of the highest pleasures of children as a way to influence academic self-efficacy and creativity of preschool children and students. So the question is, does the game-based math teaching method affect academic self-efficacy and the creativity of preschoolers and first and second graders through reverse learning? In addition, the researcher seeks to provide a model for the effect of mathematical play on the creativity and social skills and academic self-efficacy of these students.

## **II. RESEARCH METHODS**

The present study aimed at the effect of game-based mathematics education on creativity, social skills and academic self-efficacy of preschool students through reverse learning. The research method was quasi-experimental and applied in terms of purpose. The research plan is pre-test and post-test with the control group. The statistical population consisted of

primary school boys and girls, of which a sample of 40 people by multi-stage cluster random sampling, first two districts 1 and 2 randomly, and among them two schools to A random preschool class was randomly selected from both schools, and from these two schools, a sample of 40 people consisting of 20 individuals for the control group and 20 individuals for the control group was selected. One of the groups was the experimental group. Star Math game training (Starmath) was taught and questionnaires were distributed among them, and then the data was entered into the SPSS software and in return, no training was given to the control group. In this plan, there is a test group and a control group. The number of research samples was divided into two groups after random sampling. Prior to the training (intervention), the study participants were pre-tested for the dependent variables of academic self-efficacy and creativity. After this stage, the participants of the experimental group received eighteen sessions of star-based math training and the control group did not receive any training. Then, the participants of the experimental and post-test control group were tested.

#### **Information collection method**

To measure the variables in the present study, three questionnaires of creativity, social skills and academic self-efficacy were used:

##### **Creativity Questionnaire**

To test creativity, the B-shaped torrent creativity test was used. The Torrance Tests, which are the result of 9 years of work by Torrance et al. (1998) on creative behavior and its manifestations, have been used in many studies as a criterion for measuring creativity; These tests are based on Torrance's theory and definition of creativity, and measure four factors of initiative, expansion, fluidity, and flexibility that are partly influenced by Gilford's model of mental construction. In Iran, its reliability and validity were obtained by many researchers such as Kefayat (1994) and Haghghat (1998).

##### **Social Skills Questionnaire**

To assess social skills, a combined questionnaire will be used, which includes questions from the standard questionnaire of Tak and Trend Research Institute (2014) and additional questions by Mohammadi and Mr. Mastery (2016). The reliability of the questionnaire was 0.85. Mohammadi and Mastery also obtained the reliability of the questionnaire as 0.82 and confirmed its validity in a formal way. This questionnaire has 24 questions, 9 of which are completed by the student and 15 by the teacher. The questionnaire has five factors: self-control, perseverance, self-efficacy, leadership skills, and social communication skills.

##### **Academic Self-Efficacy Questionnaire**

To measure self-efficacy from the 1999 Jings and Morgan Educational Self-Efficacy Questionnaire, the reliability and validity of which were obtained in Iran for primary school students by Hatamzadeh Arabi, Izadi and Hashemi (2015). It has 5 goal setting factors, academic aptitude, external control source, perseverance and internal control source.

##### **Math Games**

Star Mathematics (Starmath) was used for the math game, which has 9 factors: focus, memory, exploration skills, creativity, planning, discipline, economic intelligence, speed of mind processing, and imagination. The game is a two-player game that consists of a page, a special type of dice called Shomaran, a special tool called Chubak, about 600 cards, and other accessories that are mainly played by mathematical rules.

### **III. RESEARCH METHOD**

#### **Research method**

Prior to the investigation, a bilateral and voluntary commitment was made between the parties. The researcher undertakes to give students gifts as a reward for participating in the research after completing the practice protocol. On the

other hand, given the ethical commitment of the sample to the researcher for voluntary participation in the research, it is likely that there will be no significant decline in the research sample.

After the preliminaries, a pre-test was performed, and it was followed by the implementation of Starmath trainings for the experimental group. Training was conducted during 18 sessions and for one hour per session. Finally, after the experiment and the whole session, the post-test was performed and the role and impact of the variables were compared with the pre-test and post-test. The Mankova test was also used in SPSS software to analyze data. In order to study the research hypotheses; The data were transferred to the raw data pages of the software (Spss 20) for analysis and to the structural equations to Smart PLS software for analysis.

#### IV. FINDINGS

##### Reflective measurement model tests

Before performing the main tests, the most important initial test of the reflective measurement model should be performed. This test is a one-dimensional or homogeneous question of each variable.

##### Model reliability test:

**Table 4-7:** Structural validity and reliability indicators (Variables)

	<b>Cronbach's Alpha</b>	<b>rho_A</b>	<b>Composite Reliability</b>	<b>Average Variance Extracted (AVE)</b>
Math training	<b>0.745</b>	<b>0.758</b>	<b>0.886</b>	<b>0.796</b>
Creativity	<b>0.802</b>	<b>0.804</b>	<b>0.910</b>	<b>0.835</b>
social skills	<b>0.848</b>	<b>0.849</b>	<b>0.898</b>	<b>0.687</b>
Academic self-efficacy	<b>0.706</b>	<b>0.713</b>	<b>0.872</b>	<b>0.772</b>

##### Cronyach's Alpha: Internal correlation of questions outside the model

The Cronbach's alpha value of the components must be higher than 0.7, so the internal correlation of the questions outside the model is confirmed.

##### Fornell and Larker test:

It is less valid than the previous test, but compares the component to the component so that the two sets are not convergent. It complements the previous test.

A table changes the correlation by replacing the ones on the main diameter with the AVE square.

**Tables 4-8:** Fornell and Larker Tables

	Math training	Creativity	social skills	Academic self-efficacy
Math training	0.892			
Creativity	0.064	0.914		
Social skills	0.165	0.042	0.829	
Academic self-efficacy	0.090	0.113	0.069	0.879

Now the Average of each variable must be greater than all the correlation coefficients of that variable with the other variables.

The sum of convergent narrative conditions and the sum of divergent narrative conditions indicate the existence of structural validity in the model.

Reflective measurement model quality test

The quality of the reflective measurement model means that the questions of each variable have been able to accurately measure their corresponding variable in a measurement model. The cv com index, which is compared to three in both the article (Brin 2016) and (Hansler 2014).

**Table 4-9:** Standard quality table of reflective measurement model

Strong	Medium	Weak
0/35	0/15	0/02

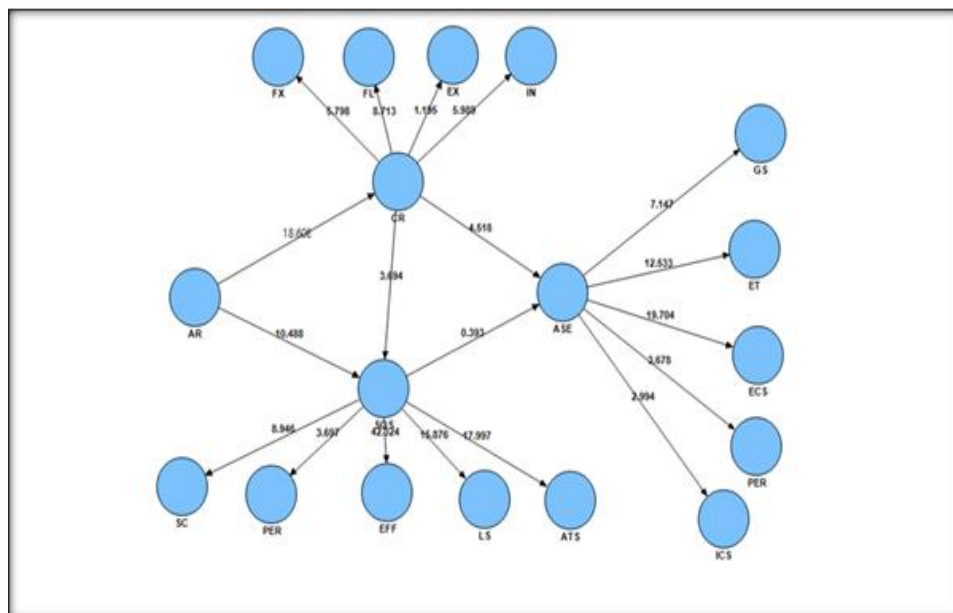
If the quality of the measurement model is less than 0.02, the model should be revised and the questionnaire re-designed.

**Table 4-10:** cv com index table

	SSO	SSE	Q <sup>2</sup> (=1-SSE/SSO)
Math training	121.699	114.349	0.060
Creativity	131.624	121.970	0.073
Social skills	2,509.648	2,509.648	
Academic self-efficacy	226.922	173.361	0.236

**Internal model (structural)**

The structural model of our research is as follows:



**Figure 4-4:** Structural model in the case of significant second-order factor loads

The structural model of our research, considering the factor of the second time, these coefficients are as follows:

**Table 4-11:** Table of functional and significant loads of the second order variables

	Original Sample (O)	T Statistics ( O/STDEV )
H1: Mathematics education has a direct impact on creativity.	1.315	4.559
H2: Mathematics education has a direct impact on social skills.	0.855	2.736
H3: Creativity has a direct impact on social skills.	0.496	3.314
H4: Social skills have a direct impact on creativity.	0.641	3.694
H5: Creativity has a direct effect on academic self-efficacy.	0.676	5.427
H6: Social skills have a direct impact on academic self-efficacy.	0.053	0.073

According to the results of social skills, it does not affect academic self-efficacy.

**Model quality test**

Standardized residual root mean square root test (SRMR)

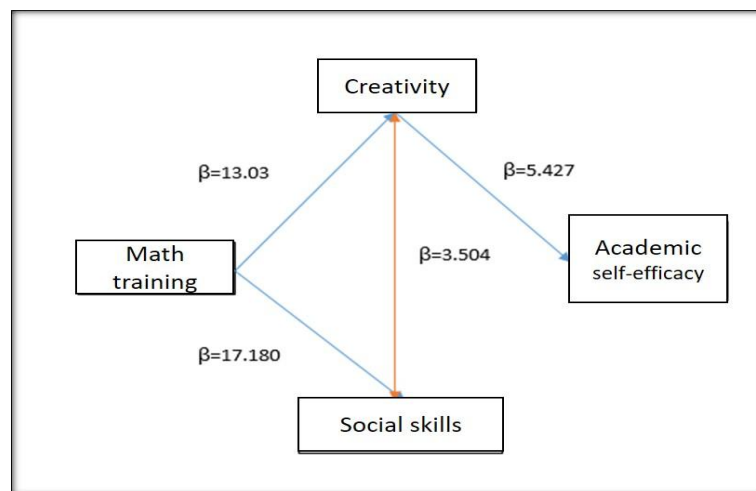
According to Hansler et al. (2014), the standardized root of the remaining square average was introduced as a suitable criterion for PLS-SEM. The value is less than 0.1 and in the conservative mode 0.08 is appropriate (Hugh and Bentler 1999)

**Table 4-12:** SRMR value

	Saturated Model
SRMR	0.074

As can be seen, the rate (RMSR) is equal to (0.074), so our model has favorable conditions and has a perfect fit.

Therefore, the final model can be designed as follows:





## V. DISCUSSION

The aim of this study was to investigate the effect of game-based mathematics education on creativity, social skills and academic self-efficacy of preschool students through Flipped learning, which showed the findings of game-based mathematics education on creativity and social skills and components. They, as well as students' academic self-efficacy, have been shown to enhance math creativity and social skills by teaching math through play, and to train self-efficacy students. Research has shown that teaching math through play affects creativity and social skills and their dimensions. Among the reasons for explaining this finding are that in mathematical learning through play, the diversity of cognitive structures from the perspective of behavioral theory based on visual sense based on visual thinking, auditory sense based on verbal thinking and tactile sense based on manipulative thinking. And a build is established. Understanding Riyadh's concepts is much more difficult for students to manipulate than the other two learning styles. So the star math game created an opportunity for all students to become familiar with different mathematical concepts through manipulation and indirectly. Specifically in the preliminary stages of fostering creativity fluidity, which refers to the production of many solutions to problems, can be used in the selection of numbers (numbers in Star Game are a new and exclusive tool. Numbers in this game replace baldness There are six facets that have been used in Iran since ancient times and were first made by an Iranian scientist named Bozorgmehr, who was the inventor of the fence board game. The counters have ten faces and are designed in two ways. It is numbered from one point to 10 points and its second face is a 9-dimensional mode on which it is numbered from zero points to 9 points. These numbers are also painted in four colors, each color in one place. It is valuable and important, and the children saw from one to four numbers depending on which stage they were in. For example, with three numbers, they add and subtract at the same time. In the division section, they also perform multiplication and division operations together. To win the cards (there are 9 cards in the star game. These cards are designed for different purposes), they must use more than one skill at a time. On the other hand, spending enough time with children allows them to go deeper and understand the concepts. Therefore, children need not be forced to learn in order to be creative. In the element of creativity, the element of creativity, which deals with unusual, strange and clever answers to problems, starts in the first session with the recognition that the student must find the numerical apparent difference between 9-digit numbers from 10-digit numbers, that is, to understand that one Numbers do not have 10 and have a number without a number. Or by playing the countdown card, in which the children throw the counters and count them upside down, this is also mentioned. In the session of recognizing and separating even numbers and odd numbers, the instructor transmits the numbers to the students' minds. In this way, everyone who brings a number with an extra dot in the middle (the number of the person) wins the card, and whoever does not win the card without the number of points, wins the element of flexibility that designs new patterns for thinking. It is also mentioned in the game that the numbers continue to be counted on the numbers, which the students identify by counting two numbers and announcing their numbers, and one counts the second counts, and the second counts as the continuation of the first counts. He should not tell the students to count the smaller number or the larger one first, but it is the vision that the students themselves should achieve. In developing an expansion element that focuses on the ability to pay attention to detail while doing an activity, a session with students with cards and sticks (a simple but powerful tool that is both brainwashing and math games with This tool is done) start making different patterns. The combination of sticks and cards is received in the form of indirect training, which is achieved in a regular manner.

In general, teaching math through play not only makes children's creativity grow, but also prepares students for tomorrow's world, which has countless problems, creativity and innovation. Group games, such as Star Mathematics, stimulate children's imagination, increase their vocabulary, and turn their hidden talents into action. Although the overall

score for creativity increased dramatically, the star's math game had little effect on the components of the expansion and flexibility of creativity on the subjects. The present findings are consistent with the results of research by Garaboski (2007), Jafari and Ali Esmaili (2017).

The findings of the present study also showed that mathematical education through play affects students' social skills. These games focus on the indirect conditions and methods of education based on recognizing and nurturing students' talents, the needs of society, and bringing the learning environment closer to external conditions and life. Developing students' social skills through star math can be traced back to their goals. The ultimate goal of Star Wars style and style games is for children to be particularly interested in learning in general and math in particular. The second purpose of this style can be considered as the application of mathematics. In this style, math textbooks and dry textbook concepts enter students' daily lives. Strengthening the general mental abilities of children can be considered the third goal of this style. The fourth goal of Starmath is for children to communicate with each other in the game. The fifth goal of this style is one of the most important goals and it can be said that it is one of the requirements and shortcomings related to today's virtual life. It aims to soften the connection between parents and children. Because in today's life, the connection between children and parents is reduced, and families spend a significant part of their time behind computers and mobile phones, and therefore have less contact with each other. Having a game with educational goals can connect this triangle of mother, father and child as much as possible. Finally, the latest goal of the Starmath style is to teach math to primary school children. Ultimately, setting this goal is because the Starmath style does not believe in blind and aimless mathematical instruction to children. In the style of math starters, it's just a means to an end, not a goal. The findings are in line with that of Grabowski (2007).

The study found that students' self-confidence increased, they learned group behaviors, experienced healthy competition in a happy and dynamic environment, and looked at issues more openly and used a variety of methods to solve them. Starsmanship-style kids with concepts such as money units, length scales, weight or mass scales, hours and minutes, and seconds are not directly mathematical concepts. But not only in Iran, but in many other countries, these concepts are taught in books and math classes. In Star Game, to increase children's self-efficacy, they learn all these concepts during the game. The cards used in this game, which are important for winning, contain messages and questions that they need to think about, answer their questions, and if they can't, they won't win the card. That's why they try to learn them with inner motivation. The research findings also showed that math teaching through play affects students' self-efficacy. In order to teach mathematics through play in reverse, we can point to the indirect aspect of concepts through this teaching method, which is one of the descriptive dimensions of the star game's indirectness. Roughly speaking, apart from the first part of the work, which is the training of counting points on numbers, no concept or operation is taught directly in any of the Starmath style sections. Children gain insights through insight and insight (Gestalt method). Numerous studies around the world have shown that the indirect method is more effective than the direct method. One of the most well-known theories in this regard is Rogers' indirect teaching theory. Rogers' indirect method, which was first used to treat the mentally ill, later became a teaching method and led to much research in the world of education. Learning in this style is completely objective and tangible. Also, because it's indirect, all the kids learn from math in this game is what they've come up with, and the coach has only played the role of a facilitator or mentor. Finally, it can be concluded that creativity and social skills, self-efficacy can be enhanced through mathematical education through play, and in this study, this was made possible by Starmath. The findings are consistent with academic self-efficacy and reverse learning with the Matsumoto (2016) study.

One of the limitations of the present study has been the lack of resources to compare results. Another limitation that caused some elements of creativity to have little effect was the implementation of the present study in a course of study, ie

preschool, due to time constraints. If possible, they may have achieved the desired goals in higher courses due to more advanced mathematical concepts.

Based on the findings of the study on the effect of mathematics education through play on creativity, social skills and academic self-efficacy in Flipped learning, he suggested to education officials to increase students' enjoyment and happiness during math education, increase interest and Students' interest in math lessons, increased learning of math lessons in students, reduction of parents' worries about learning math lessons by their children and also for optimal use of class time by the teacher in order to solve problems and learn more math math content from math game Use the star (Starmath) in elementary school.

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