

Effect of Using the Constructivist Teaching Method on Creative Thinking and Entrepreneurship

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Abstract

Background: The process of entrepreneurship and creativity are the main current principles in human life at the beginning of the third millennium AD; therefore, it is considered one of the most important goals of educational organizations. Preparing students to enter society effectively will not be provided unless creativity is cultivated among them. Therefore, the present study was conducted to use the effect of the constructivist teaching method on students' creative thinking and entrepreneurship.

Methods: In this interventional study, 40 female students in sixth grade were selected by available sampling and randomly divided into two groups of 20 (20 in the intervention group and 20 in the control group). Then, the intervention group was given the necessary training for 5 one-hour sessions. The investigated variables were collected from demographic questionnaires, Abedi's creativity, and Lumpkin and Dess's tendency to entrepreneurship through pre-test and post-test. Data analysis was performed using SPSS software (version 25) and descriptive statistical methods of covariance test.

Results: In terms of parents' education level and household income, no difference was observed between the two groups ($P > 0.05$). The average score of creative thinking in the intervention group increased from 67.55 before the intervention to 75.75 after the intervention; however, in the control group, the average score decreased from 20.68 in the pre-test to 55.61 in the post-test. Additionally, the average score of entrepreneurial tendency in the intervention group increased from 43.75 before the intervention to 54.50 after the intervention; however, in the control group, the average score increased from 40.10 to 42.50.

Conclusions: The constructivist teaching method plays a significant role in the learning approach. In addition, the use of this method can be effective in increasing the tendency to entrepreneurship. Considering the importance of entrepreneurship, teaching constructivist courses in universities and schools is appropriate.

Keywords: Constructivist; Teaching Method; Creative Thinking; Entrepreneurship

1. Background

Creativity and innovation are considered the highest and most complex mental activities of a person (1), which are the most important goals of education and training (2). Creative individuals who rely on their abilities can deal with the confronted problems of life (3, 4). Creativity is an ability that undeniably exists in every human's life; however, it is necessary to be cultivated and strengthened (5).

In this fourth industrial era, students need to be able to think creatively when dealing with more complex economic issues (6). The ability to develop multiple innovative solutions to a problem is known as creativity (7) and

can be perceived as a way of thinking or an idea that comes up spontaneously and imaginatively (8). Creativity and entrepreneurship have a strong association (9); therefore, the process of entrepreneurship and creativity has been considered one of the main principles of human life at the beginning of the third millennium AD (10, 11). Creativity is cultivated through entrepreneurial methods in the form of providing services and solutions or producing products (9), and it is necessary for overcoming obstacles and creating competition in entrepreneurship (12). Entrepreneurial intentions are influenced by creativity, with higher levels of



creativity leading to higher entrepreneurial intentions (13).

Entrepreneurship is a process in which opportunities for the production of future products and services are discovered, evaluated, and exploited (14, 15). Entrepreneurial orientation, which includes five dimensions (risk-taking, innovation, pioneering, aggressive competition, and independence), helps individuals to be aware and alert when facing new technologies, identify opportunities, and launch economic activities (16). In today's world, entrepreneurship and innovation are considered one of the most important goals of educational organizations. Preparing students to effectively enter a society based on knowledge, technology, and innovation will not be possible unless they cultivate creativity (17). Creativity starts from pre-elementary school; however, during entering school and the beginning of the literacy stage, compliance and obedience are learned, and as a result, children's creativity is decreased (18).

The type of teaching method is effective in increasing the creativity of learners (5). One of the methods of fostering creativity and innovation in schools is to apply and use learner-centered teaching methods using the constructivist learning cycle model (19). The main goal of this model is to provide opportunities for students to examine their belief systems and achieve self-regulation and knowledge construction by reasoning, predicting, and testing hypotheses (20). The theory of constructivism is based on observation and the way individuals build their understanding and knowledge of the world through experiencing things and reflecting on them. Additionally, it shows how individuals react when they come across something new, attempt to reconcile it with their earlier ideas and experience, and then decide whether to believe or reject the new information as unimportant (21).

Previous findings showed that teaching constructivism improves students' scientific reasoning and creativity, and a direct and linear relationship between creativity and reasoning scores with the constructivist teaching model was observed (20, 22). One of the major weaknesses of education in Iran is the fact that students are not prepared for creativity, innovation, entrepreneurial thinking, and problem-solving tasks in comparison to advanced countries (23). Currently, it is time for the application of new methods to turn students into lifelong learners and for thinking, reconstruction, and experiential learning to replace traditional methods in schools (20). Therefore, this study investigated

the effect of the constructivist teaching method on creative thinking and entrepreneurial perception of the 6th-grade elementary school females of Ferdows, Iran.

2. Methods

2.1. Study Design and Sample Selection

This interventional research was carried out using a pre-test-post-test design with a control group. The statistical population was 40 sixth-grade female students of Ferdows in the academic year of 2020 - 2021, who were selected by the random sampling method. Then, the students were randomly divided into two groups of 20 individuals (20 in the intervention group and 20 in the control group).

2.2. Method of Implementing the Plan and Intervention

After receiving permission from the education department and identifying the sample, the method and process of the research, confidentiality, the right to withdraw from the research, and full consent were explained to those who were willing to participate in the study. Then, the intervention group was given the necessary training for 5 one-hour sessions based on the instructional package of the constructivist teaching method taken from the book "active teaching patterns" by Afshari and Erfan Far (24). The intervention was carried out by a trained person (a student of the master's course in educational sciences, majoring in elementary education). The control group was not given special training in this field. Before intervention and one month after the final education session, the pre-test and post-test were completed by participant students.

2.3. Research Tool

In this study, to measure the desired variables from the demographic questionnaire (parents' education and family income), Abedi's creativity questionnaire (25), Lumpkin and Dess (26) entrepreneurial tendency questionnaire, and the constructivist teaching method package taken from the book of "models active teaching" by Afshari and Erfan Far (24) were used. The content of the training package is presented in Table 1.

Table 1. Educational Package of Constructionism Teaching Method

Session	Area	The Role of the Teacher	The Role of the Students
1	Engaging and activating thinking	Creating interest, arousing curiosity, posing questions, and... diagnostic evaluation	Asking questions, showing interest, thinking about how to discover the material
2	Exploration and research	Encouraging students to work together without direct teaching by the teacher, observing and listening to students interacting, posing intelligent questions, providing opportunities for students to discuss and exchange ideas to solve problems, and appropriately using real issues.	Thinking freely, testing predictions and hypotheses, hypothesizing results, testing different options and discussing them, recording observations and different opinions.

3	Explain	Encouraging students to explain concepts and definitions in their own language, asking students to provide evidence and reasons, correctly presenting definitions, using previous experiences	Explaining possible solutions and answers to others, exchanging opinions and listening responsibly to the explanations of others, listening and trying to understand the teacher's explanations, referring to previous activities, and using the observations they recorded while giving explanations.
4	Elaborate	Expecting students to use the official titles, definitions, and explanations provided, encouraging students to practically develop concepts and skills in new situations, reminding students of the explanations provided, and strategies for the exploration stage.	Applying labels, definitions and explanations, skills in similar new situations, checking the understanding of the subject by peers, and making decisions.
5	Evaluate	Observing the students during the measurement activity, evaluation of their knowledge or skills, searching for evidence of change in students' thinking and behavior, giving opportunities for self-evaluation, posing open-ended questions, and... evaluation process before, during, and after teaching.	Answering questions shows their knowledge or skills and evaluates their activities by asking questions. Designing questions for further thinking and research

Abedi's creativity assessment questionnaire was developed in Tehran, Iran. This questionnaire has 60 three-choice items that measure the four components of fluidity, flexibility, innovation, and expansion. A score of less than 60 indicates low creativity, a score of 60 to 120 indicates average creativity, and a score of 120 or higher indicates high creativity. The validity and reliability of this questionnaire have been investigated separately in two studies in Iran and Spain, which were confirmed in all creativity components in both studies (27). It was evaluated in terms of internal consistency and test-retest reliability. Torrance's creative thinking test was used as a concurrent validity index for Abedi's creativity test, and the coefficients of the subscales of fluidity, expansion, initiative, and flexibility were 23%, 44%, 61%, and 59%, respectively. In this study, Cronbach's alpha method was used to determine the reliability of the questionnaire, and the reliability rate was 0.79.

Lumpkin and Dess's entrepreneurship tendency questionnaire has 5 dimensions of innovation, risk-taking, proactive action, aggressive competition, and independence, including 23 items in a 5-point Likert format. The very high option is given a score of 5, the high option with a score of 4, the average with a score of 3, the low with a score of 2, and the very low with a score of 1. Forozanfar et al. examined the validity and reliability of the questionnaire (28) through the opinion of experts and construct validity using confirmatory factor analysis, and Cronbach's alpha coefficient greater than 0.8 for different constructs of the questionnaire confirmed its reliability. In the current study, Cronbach's alpha method was used to determine the reliability of the questionnaire, and the reliability rate was 0.72.

ability rate was 0.72.

2.4. Statistical Analysis

The data were analyzed using SPSS software (version 25). Descriptive statistical methods, such as mean and standard deviation, were used to describe the data, and multivariate analysis of covariance (MANCOVA) was applied to analyze the data.

2.5. Ethical Considerations

This study was approved by the Ethics Committee of Birjand University of Medical Sciences with code IR.IAU.BIRJAND.REC.1402.027. In addition, the parents of the participants were assured of the confidentiality of their information and the non-disclosure of data individually. Moreover, all parents completed the informed consent form before participating in the study.

3. Results

The demographic information of the participants is presented in Table 2. According to the chi-square test, there were no differences between the intervention and control groups in terms of parents' education level and family income ($P > 0.05$). The scores of the test of creative thinking and tendency to entrepreneurship before and after the intervention in 2 groups and the result of checking the normality of the data distribution are presented in Table 2. The significance level was higher than 0.05, and the data had a normal distribution; therefore, parametric tests were used to analyze the data.

Table 2. Participants' Information in Terms of Parents' Education and Family Income

	Frequency (%)	P-Value ^a
Education		
Father		0.93
Illiterate-elementary school	5 (12.5)	
Middle school	6 (15)	
High school-diploma	12 (30)	
University education	17 (42.5)	
Total	40 (100)	
Mother		0.82
Illiterate-elementary school	3 (7.5)	
Middle school	4 (10)	
High school-diploma	8 (20)	
University education	25 (62.5)	
Total	40 (100)	
Income		0.78
Poor	10 (25)	
Average	22 (62.5)	
Good	8 (20)	
Total	40 (100)	

^a Chi-square test.

As observed in Table 3, the average score of creative thinking in the intervention group increased from 67.55 before the intervention to 75.75 after the intervention; however, in the control group, the average score decreased from 68.20 in the pre-test to 61.55 in the post-test. Additionally,

the average score of entrepreneurial tendency in the intervention group increased from 43.75 before the intervention to 54.50 after the intervention; however, in the control group, the average score increased from 40.10 in the pre-test to 42.50 in the post-test.

Table 3. Scores and Normality of the Components of Creative Thinking and Entrepreneurship in Intervention and Control Groups Before and After the Intervention

Component and Group	Mean ± Standard Deviation		Data Normality Test, Kolmogorov-Smirnov	
	Intervention	Control	Test Result	Significance Level
Fluidity				
Pre-test	11.50 ± 1.82	10.70 ± 3.13	1.03	0.24
Post-test	14.00 ± 3.49	11.20 ± 3.38	0.86	0.46
Flexibility				
Pre-test	14.00 ± 6.54	14.75 ± 4.14	0.82	0.52
Post-test	16.50 ± 4.33	12.10 ± 3.26	0.79	0.57
Innovation				
Pre-test	30.70 ± 3.56	31.60 ± 5.43	0.73	0.66
Post-test	30.80 ± 3.93	26.20 ± 4.31	0.64	0.81
Expansion				
Pre-test	11.35 ± 3.17	11.15 ± 3.65	0.90	0.39
Post-test	14.45 ± 3.44	12.05 ± 3.44	0.73	0.65
Creative thinking				
Pre-test	67.55 ± 6.72	68.20 ± 5.72	1.05	0.20
Post-test	75.75 ± 6.88	61.55 ± 9.57	0.50	0.96
Tendency to entrepreneurship				
Pre-test	43.75 ± 8.37	40.10 ± 8.74	0.97	0.31
Post-test	45.50 ± 9.41	42.50 ± 9.06	0.67	0.76

The independent t-test results were not significant for any of the components of creative thinking and entrepreneurship tendency ($P > 0.05$). Therefore, both groups were equal in the baseline. Levene's test confirmed the same variances in the intervention and control groups. Additionally, the results of the pre-test and post-test regression slope homogeneity test of the components of creative thinking and entrepreneurial tendency showed that the regression slope was the same in both groups (creative thinking $F = 0.80$, $P = 0.38$; entrepreneurial tendency $F = 0.04$, $P = 0.85$). Box's M test revealed that the covariance matrix of the dependent variables in the two

groups was equal (Box M = 17.65, $F = 1.49$, $P = 0.14$).

After examining the assumptions of multivariate covariance analysis, a significant difference in creativity was observed between the two groups (Wilk's lambda = 0.50, $F = 7.89$, $P < 0.001$), which showed that there was a significant difference between the intervention group and the control group, at least in some of the components of creative thinking (fluidity, innovation, expansion, and flexibility). To evaluate which of the components of creativity in the intervention and control groups differ from each other, univariate analysis of variance was performed, and the results are reported in Table 4.

Table 4. Results of Multivariate Covariance Analysis on the Post-test of the Average Creative Thinking Components of Intervention and Control Groups with the Expansion of the Pre-test

Group and Dependent Variable	Mean Square	Degree of Freedom	Mean Square	F	Significance Level	Effectiveness	Test Power
Group							
Fluidity	80.72	1	80.72	6.39	0.01	0.16	0.69
Flexibility	229.13	1	229.13	17.15	0.00	0.34	0.98
Innovation	247.52	1	247.52	14.89	0.03	0.30	0.96
Expansion	43.40	1	53.40	4.44	0.04	0.12	0.53
Error							
Fluidity	429.32	34	12.63				
Flexibility	454.25	34	13.36				
Innovation	565.26	34	16.63				
Expansion	409.01	34	12.32				

The results showed that after the intervention, there was a significant difference in the scores of the two groups in the flexibility initiative component ($P < 0.05$, $17.15 = [1, 34 f]$), the expansion component ($P < 0.05$, $4.44 = [1, 34 f]$), the fluidity component ($P < 0.05$, $6.39 = [1, 34 f]$), and the innovation component ($P < 0.05$, $14.89 = [1, 34 f]$). Therefore, it can be concluded that there was a significant difference between the scores of creative thinking in the intervention group and expansion after the intervention.

The results showed that the implementation of the pre-test affected the post-test scores ($P = 0.001$, $F = 93.59$). In addition, there was a significant difference between the degree of tendency to entrepreneurship in the intervention and control groups ($P = 0.001$, $F = 28.87$). Therefore, it can be concluded that applying the constructivist teaching method had a positive effect on increasing the entrepreneurship tendency of sixth-grade female students (Table 5).

Table 5. Results of Univariate Covariance Analysis on the Mean Scores of Post-test Entrepreneurship Tendency of Intervention and Control Groups

Variables	Sum Square	Degree of Freedom	Mean Square	F	Significance Level	Effectiveness	Test Power
Pre-test	2322.01	1	2322.01	93.59	< 0.001	0.72	1
Group membership	716.30	1	716.30	28.87	< 0.001	0.44	1
Error	917.99	37	24.81				
Total	4680.00	39					

4. Discussion

This study aimed to investigate the effect of using the constructivist teaching method on creative thinking and entrepreneurship tendencies in sixth-grade female students of Ferdows City. The results of multivariate covariance analysis showed that the use of the constructivism

teaching method increases the score of creativity components; accordingly, in the intervention group, after the intervention, the scores of flexibilities, expansion, and innovation competition components increased significantly ($P < 0.05$).

The findings of this study are in agreement with the results of studies by Goodarzi Sorkhi et al. (29), Naemi et al. (30), Ghaedi et al. (31), Kumar Shah R et al. (2019) (32), Noreen et al. (33), Ahmadi et al. (34), Jack (35), and Mohebbi (36). The aforementioned studies demonstrated that the learning cycle model based on the constructivist approach has a positive significant effect on increasing academic motivation, creativity, and its components in female students. Active participation in classrooms is promoted due to the theory of constructivism, which supports various educational methods, including problem-based learning, research-based learning, project-based learning, case-based learning, and discovery-based learning (37). In addition, it is significantly more effective than the traditional teaching method in the development of students' learning and creativity (38).

In this method of learning, students are placed in the center of learning, and learning is facilitated directly by reasoning, asking questions, and finding important answers. In the discovery phase, students examine possible answers in relation to the raised question. In the explanation stage, the teacher provides the basis for correcting misconceptions by asking questions about the concepts formed in the previous stages. In the expansion and generalization phase, students get a chance to adapt their knowledge to a new situation and apply it in their real life. In the evaluation stage, they ensure the learning, development, and feedback and evaluate the previous stages. The constructivist approach focuses on four aspects of knowledge production instead of knowledge transfer and new learning according to previous knowledge. The improvement of learning is emphasized in the shadow of social interactions and learning development (39).

In addition, the results of variable covariance analysis showed that there was a significant difference between the degree of entrepreneurship tendency in the intervention and control groups ($P = 0.001$, $F = 28.87$), which indicates the positive effect of using the constructivist teaching method in increasing students' entrepreneurship tendency. In this context, the results of the study are consistent with the results of similar studies.

The results of studies by Mirzaloo and Mousavi Kashi (40), Sayadi and Mesrabadi (41), Pandey (42), and Cardon and Kirk (43) showed that the teaching method which is based on the approach of functionalism, and constructivism has a positive and significant effect on students' performance; accordingly, concept map teaching (as one of the methods of constructivism) has a positive significant effect on educational progress indicators (cognitive, meta-cognitive, and emotional) and academic progress. In addition, this method increases students' problem-solving ability, and the positive relationship between self-efficacy and entrepreneurship leads to a positive effect on individuals' entrepreneurial enthusiasm. The aim of entrepreneurship among students in elementary school is not to create a new device or start a business; rather,

it is to attempt to eliminate obstacles that reduce motivation and innovation in their minds. The constructivist method, by increasing creativity and quality of learning, is an important factor in motivating students regarding entrepreneurial activities (44).

In general, most forward-looking professions today require employees to be innovative and take risks. Both creativity and entrepreneurship are necessary and related skills (45). Therefore, students in the digital age and contemporary society need creativity to solve complex problems in many complex situations (46). On the other hand, in order to have effective learning for students, it is necessary to transform the old style of teaching into a creative and constructive style (32). Therefore, the researcher used an approach based on functionalism and constructivism to strengthen students' learning. This approach is proactive in developing advanced skills, such as critical thinking, analysis, evaluation, and creation. Additionally, it encourages students to think critically, assess their work, and pinpoint necessary skills to acquire based on their requirements (47). This participation and active collaboration of students in classrooms makes it different from traditional teaching methods (48).

In the current study, although many efforts were made in the direction of objectivity, precision, and accuracy of the results, there were some limitations, including the use of the self-reported questionnaire, according to which the results should be interpreted with caution. Another one was the time limitation in the full implementation of the constructivist teaching method, including the preparation of teachers and observing its long-term effect. Therefore, it is suggested that the volume of textbooks should be adjusted in such a way that they have enough time to cultivate creative thinking and have enough opportunity to meditate, exchange ideas, and analyze information. Active teaching methods, including constructivism, should be taught to teachers in the form of in-service courses.

4.1. Conclusions

Using the constructivist teaching method plays a significant role in the learning approach. In addition, applying this method can be effective in increasing students' entrepreneurship tendencies.

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