Comparison of the effectiveness of critical thinking training and social cognitive training on the emotional creativity of female students of the first secondary school

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ARTICLE INFORMATION	ABSTRACT
	Background and Aim: In today's world, it is believed that one should have global thinking, but implement these global thoughts locally. This can also be considered as the localization of global thoughts and ideas. The purpose of this research was to compare the effectiveness of critical thinking training and social cognitive training on the emotional creativity of female students of the first secondary school. **Methods:** The current research method was quasi-experimental with a pre-test-post-test design with a control group and a one-month follow-up, which was conducted in Sabzevar high schools in 2021-22. The statistical population was made up of all the students of the first secondary school age range, who were selected as available and according to the sample size of 98 female high school students. The tools for collecting information were library studies, questionnaires and documents. In the collection of information, a questionnaire measuring emotional creativity was used as a tool. The sampling method in the present study was available by sampling method. The sample size included 66 people, that is, 33 people were considered for each group. In this research, the components and the total score of emotional creativity were the dependent variables, and the information related to them was collected in the three stages of pre-test, post-test and follow-up from the participants of the experimental and control groups, and to test the effectiveness of the implementation of the independent variable on the dependent variable of the method Analysis of variance with repeated measures was used. The software used is SPSS version 26. **Results:** The difference in the average scores of the components and the total score of emotional creativity in the pre-test-post-test and pre-test-follow-up stages was statistically significant, but the difference in the average scores in the post-test-follow-up stages was not significant. The difference in the mean of the components and the total score of emotional creativity in the two groups of critical thinking and control is statistically significant. The difference in the effect of two methods of social cognitive education and critical thinking on the components of readiness, innovation, effectiveness and the total score of emotional creativity was significant. **Conclusion:** According to the results of the research, critical thinking and social cognitive training has increased the emotional readiness of female students in the first year of high school. Critical thinking training created a significant difference between the control and experimental groups in terms of the variable of emotional creativity. And critical thinking and social cognitive training has improved innovation in female students of the first year of high school. Teaching critical thinking and social cognition has not had a significant impact on students.

Introduction

The cultivation of learners' cognitive skills has always been considered one of the most important educational goals in educational forums worldwide (Stapleton, 2011). Concern about the weakness and deficiency of critical thinking in students is not specific to one country or region, but encompasses all educational systems worldwide (Abdollahi, Darbani & Parsakia, 2022). Although the interest in developing cognitive abilities and critical thinking is not new, and the origin of such interest dates back to the theories of Plato, international research shows the inability of students in logical reasoning and analysis (Chat, 2013). Bailin and Siegel (2003) believe critical thinking is a fundamental and ideal goal of education. Ennis (1996) defines critical thinking as a process aimed at reaching reasoned decisions about what is believed and acted upon, considering it reflective and rational thinking based on which one makes decisions about beliefs and actions. A critical thinker strives to carefully analyze discussions, search for evidence and reach a final conclusion. Wolfolk (1995) describes critical thinking as the assessment of decisions through the logical and systematic examination of issues, evidence, and solutions (Bailin & Siegel, 2003).

Critical thinking is reasoned, systematic, effective, logical, and outcome-based thinking that scientifically examines and analyzes all available information and opinions (Smeltzer, Bare, Brunner & Suddarth, 2005). Wilson considers critical thinking as a cognitive activity related to how the mind is used, providing tools for analysis through constructive doubt and skepticism, leading to better decision-making and more compatible problem-solving (Wilson, 2017). Achieving such thinking requires a change in teacher-centered teaching methods, not only inadequate for developing students' critical thinking but also exacerbating learning problems by increasing dependency on the teacher (Abdollahi, Darbani & Parsakia, 2022).

Eisner (1983) argues that today's schools focus only on reading, writing, and arithmetic skills, which are not inherently valuable nor virtues in education. The issue is not whether a student can read but what and how they read. The value of schools lies in educating erudite humans (Dehghani, 2016). Edelman and Tyler (2000) state that if schools focus solely on formal education and school activities and classroom behavior management only assist students in achieving formal success, they will not be successful in achieving their goals. Carpenter (2000) designed cognitive-social skills training, including four steps: guidance, positive and negative modeling, demonstration, evaluation, and three major skills: cooperation, reassurance/support, and communication. This training emphasizes problem-solving skills instead of overt behavioral skills, aiming to adjust and accommodate processes underlying negative behaviors in behavioral disorders (Hadi Mohammadloo, 2016).

Gresham and Elliott (1997) believe social skills are society-approved acquired behaviors that enable individuals to interact with others in a way that elicits positive responses and avoids negative ones, and to establish relationships with others. Emotional creativity, in a new approach parallel to emotional intelligence, is considered an effective factor in regulating emotions and mental health. It is thought that emotional creativity is related to a person's rich emotional life (Ayvazoy, Baraket, Mayar, 2007). Kohn (2001) suggests that emotional intelligence may be more important than cognitive intelligence, as many learnings require social and emotional skills (Parsakia, Rostami & Saadati, 2023). Social-emotional learning leads to advancement in skills like stress management, problem-solving and decision-making, conflict resolution, self-management, leadership, responsibility, and the development of commendable behaviors (Zins et al., 2004).

The question arises whether these skills are innate from birth or can be acquired through practice and time. Therefore, the researcher in this study intends to investigate the effectiveness of critical thinking and cognitive-social training on emotional creativity. Hence, the primary issue this research aims to address is: Can cognitive-social and critical thinking training impact emotional creativity?

Method

The present research method is a quasi-experimental pretest-posttest design with a control group and a one-month follow-up, conducted in middle schools (first level) in the city of Sabzevar during the 2021-2022 academic year. The statistical population consisted of all female students in the first level of middle school, accessible based on the sample size of

98 students. To identify the samples, a list of tenth-grade classes and the number of students in each class in each school was prepared. The share of each school and class (considering their number) for the control and experimental groups was calculated. After selecting the sample group through accessible sampling and using Cohen's formula, the sample group was assigned to control and experimental groups. Only the experimental group was exposed to the independent variable to control differences between the subjects. These groups were selected to be as homogeneous as possible concerning various variables, and the presence of a control group controls confounding variables. The experimental group students were identified, and an orientation session was held for them, but the control group students were given questionnaires under usual conditions and were asked to complete them. The data collection tools were library studies, questionnaires, and documents. Emotional creativity assessment questionnaires were used as a tool for data collection.

The sampling method used in this study was convenience sampling. The sample size was determined based on the age range of the first level of middle school education and using Cohen's formula, including 66 individuals, with 33 individuals considered for each group. Initially, two classes were selected (one as the control group and the other as the experimental group), and from these, students who met the study's entry criteria were chosen. Cohen's sampling formula is as follows: in this formula, $Z\alpha/2$ at the 5% error level α is calculated to be 1.96. The value of the error d was considered to be 0.05. The sample size for each group was 33 individuals.

Materials

1. Averill's Emotional Creativity Inventory (1999): This questionnaire, developed by Averill (1999) to measure emotional creativity in four dimensions—novelty, effectiveness, honesty, and emotional preparedness—consists of 30 items, measuring 7 items of emotional preparedness, 14 of novelty, 5 of effectiveness, and 4 of honesty. A five-point scale ranging from very low to very high is provided for each item. Averill (1999) determined the reliability of the total emotional creativity score using Cronbach's alpha method to be 0.91 and the reliability of the dimensions of preparedness, effectiveness, honesty, and novelty as 0.80, 0.89, 0.80, and 0.85, respectively. For the questionnaire's validity, factor analysis and correlation with similar tests were used, resulting in three dimensions instead of four according to factor analysis. The dimensions of effectiveness and authenticity formed one factor (Jokar & Alborzi, 2008). Gottbals and Averill (1996) estimated the test's reliability coefficient using Cronbach's alpha method to be 0.86 and reported a range between 0.80 to 0.89 for the four dimensions. In Iran, Abdollahi et al. (2008) reported Cronbach's alpha coefficients of 0.68 and 0.65 for athlete and non-athlete university students, respectively. Jokar and Alborzi (2008) also confirmed the existence of three factors—novelty, preparedness, effectiveness, and honesty—through exploratory factor analysis using the principal component method, based on the Scree plot and eigenvalues higher than one. They reported the reliability using Cronbach's alpha method for the total creativity score to be 0.90 and for the dimensions of novelty, effectiveness/honesty, and preparedness as 0.83, 0.82, and 0.68, respectively. Their findings were similar to those of Averill (1999).

2. Critical Thinking Training Protocol: In this study, critical thinking training sessions were organized and conducted over 8 sessions based on theories and research background.

Table 1. Critical thinking training		
Session	Title	Content
1	Introduction to Critical Thinking	- Introduction to the importance of critical thinking- Group ice-breaking exercises- Discussion about personal experiences in critical reasoning
2	Identifying Arguments	- Workshop on recognizing and constructing arguments- Exercises on distinguishing between arguments and non-arguments- Group discussion on the use of arguments in daily life
3	Logical Fallacies	- Teaching common logical fallacies- Analyzing examples of fallacies in media and literature- Role-playing to demonstrate fallacies in arguments
4	Evidence and Reasoning	- Workshop on the role of evidence in critical thinking- Exercises on linking evidence to arguments- Group activities on evaluating the strength of evidence
5	Hypothesis Testing	- Introduction to hypothesis formation and testing- Group exercises on developing and

		testing hypotheses- Analysis of case studies for hypothesis testing
6	Decision Making	- Teaching decision-making processes- Role-play scenarios for decision making- Group exercises on making decisions under uncertainty
7	Problem Solving	- Workshop on problem-solving strategies- Individual and group exercises on solving complex problems- Case study analysis for practical problem-solving techniques
8	Review and Evaluation	- Review of critical thinking skills learned- Individual and group presentations on learning experiences- Feedback and evaluation of the course

3. Cognitive-Social Training Protocol: In this study, cognitive-social training sessions were organized and conducted over 8 sessions based on theories and research background.

Table 2. Cognitive-social training		
Session	Title	Content
1	Introduction to Social Skills	- Introduction to the importance of social cognitive skills- Group ice-breaking exercises- Discussion on personal experiences in social interactions
2	Self-awareness and Self-acceptance	- Workshop on self-awareness- Exercises on self-acceptance- Group discussion on the importance of self-awareness in social relationships
3	Understanding Others	- Teaching interpretation of body language and emotional states- Role-playing exercises for better understanding of others- Case study analysis of social behaviors
4	Communication Skills	- Workshop on effective communication principles- Exercises on active listening and conversation skills- Role-playing to enhance communication skills
5	Conflict Resolution and Negotiation	- Workshop on conflict resolution- Simulation of conflict situations and solution-finding- Exercise on negotiation and reaching agreements
6	Empathy and Collaboration	- Exercises to strengthen empathy- Group activities to enhance collaboration- Group discussion on the importance of empathy in society
7	Managing Social Stress and Pressures	- Teaching stress management methods- Workshop on relaxation and deep breathing exercises- Discussion on personal experiences of social pressures and coping strategies
8	Conclusion and Evaluation	- Review of learned social skills- Individual and group presentations on learning experiences- Feedback and evaluation of the course

Implementation

The variables studied in the research included critical thinking training and cognitive-social training as the independent variables and emotional creativity as the dependent variable. Background variables included age, gender, occupation, and educational level. The entry criteria for the research were the students' willingness to participate in the research, the willingness of the students' families for their participation, and being in the age range and educational level of the first middle school. The criteria for non-entry into the research included students' unwillingness to participate, the families' unwillingness for their children to participate, and being outside the age range and educational level of the first middle school.

In selecting the statistical method for data analysis, critical thinking training and cognitive-social training were considered as independent variables, and emotional creativity as the dependent variable. Initially, descriptive statistics (frequency, percentage, mean, and standard deviation) of the samples were analyzed, followed by inferential statistics using the Multivariate Analysis of Covariance (MANCOVA) test to compare data between the two groups (control and experimental). The software used was SPSS version 26.

Results

In this study, 98 female middle school students participated (32 in the cognitive-social training group, and 33 in each of the critical thinking training and control groups). In the cognitive-social training group, 7 participants were 11 years old, 9 were 12 years old, 8 were 13 years old, and 8 were 14 years old. In the critical thinking training group, 9 participants were 11 years old, 8 were 12 years old, 11 were 13 years old, and 5 were 14 years old. In the control group, 10 participants were 11 years old, 10 were 12 years old, 8 were 13 years old, and 5 were 14 years old. In the cognitive-social training group, the mean and standard deviation of the fathers' age were 48.56 and 6.27 years, in the critical thinking group 49.55 and 6.61 years,

and in the control group 49.91 and 6.34 years, respectively. Also, in the cognitive-social training group, the mean and standard deviation of the mothers' age were 46.09 and 5.05 years, in the critical thinking group 44.45 and 5.00 years, and in the control group 44.94 and 5.60 years, respectively. In the cognitive-social training group, the educational level of the fathers of the participants was 7 with a diploma, 5 with an associate degree, 11 with a bachelor's degree, and 9 with a master's degree or higher. In the critical thinking group, it was 6 with a diploma, 6 with an associate degree, 15 with a bachelor's degree, and 6 with a master's degree or higher, and in the control group, it was 5 with a diploma, 8 with an associate degree, 14 with a bachelor's degree, and 6 with a master's degree or higher. Similarly, in the cognitive-social training group, the educational level of the

mothers of the participants was 9 with a diploma, 6 with an associate degree, 9 with a bachelor's degree, and 8 with a master's degree or higher. In the critical thinking group, it was 12 with a diploma, 5 with an associate degree, 10 with a bachelor's degree, and 6 with a master's degree or higher, and in the control group, it was 9 with a diploma, 6 with an associate degree, 13 with a bachelor's degree, and 5 with a master's degree or higher. The use of Pearson's chi-square statistical method showed that there was no significant difference between the groups in terms of parents' education level. Table 1 shows the mean (standard deviation) of and Shapiro-wilk's index components and total emotional creativity score in participants of the research groups, in three stages of pre-test, post-test, and follow-up.

Table 3. Mean (Standard Deviation) for three groups				
Variable	Group	Pre-test	Post-test	Follow-up
Preparedness	CGT	(3.97) 17.72	(4.43) 24.09	(4.68) 25.69
	CTT	(3.77) 16.84	(4.06) 22.42	(3.89) 21.54
	Control	(4.50) 18.48	(3.82) 17.48	(3.87) 18.51
Innovation	CGT	(7.85) 31.93	(8.17) 44.62	(7.30) 46.97
	CTT	(7.49) 33.06	(8.27) 41.15	(9.45) 39.72
	Control	(6.88) 31.39	(7.10) 35.09	(7.13) 34.82
Effectiveness	CGT	(3.07) 12.50	(3.30) 19.90	(4.11) 20.65
	CTT	(2.69) 13.91	(3.52) 17.06	(3.55) 16.30
	Control	(2.73) 13.39	(3.10) 13.45	(2.61) 13.70
Honesty	CGT	(2.51) 9.78	(3.52) 15.22	(2.63) 14.58
	CTT	(2.72) 10.73	(3.56) 13.30	(2.85) 13.24
	Control	(2.76) 10.81	(2.51) 11.45	(2.87) 10.67
Total	CGT	(12.61) 71.93	(11.75) 103.84	(12.33) 107.87
	CTT	(9.26) 74.55	(11.95) 93.91	(12.98) 90.82
	Control	(12.03) 74.00	(9.90) 77.48	(9.28) 77.69
Preparedness	CGT	(0.099) 0.944	(0.026) 0.924	(0.475) 0.969
	CTT	(0.528) 0.972	(0.041) 0.932	(0.172) 0.954
	Control	(0.414) 0.967	(0.732) 0.978	(0.070) 0.940
Innovation	CGT	(0.248) 0.958	(0.185) 0.954	(0.632) 0.975
	CTT	(0.092) 0.945	(0.060) 0.938	(0.039) 0.932
	Control	(0.059) 0.938	(0.116) 0.948	(0.134) 0.950
Effectiveness	CGT	(0.482) 0.969	(0.062) 0.937	(0.552) 0.972
	CTT	(0.316) 0.963	(0.201) 0.956	(0.464) 0.969
	Control	(0.140) 0.951	(0.284) 0.961	(0.138) 0.951
Honesty	CGT	(0.031) 0.926	(0.195) 0.955	(0.298) 0.961
	CTT	(0.321) 0.963	(0.042) 0.933	(0.587) 0.974
	Control	(0.369) 0.966	(0.146) 0.951	(0.072) 0.941
Total	CGT	(0.132) 0.949	(0.600) 0.973	(0.196) 0.955
	CTT	(0.940) 0.986	(0.083) 0.943	(0.316) 0.963
	Control	(0.163) 0.953	(0.798) 0.980	(0.963) 0.988

Table 3 demonstrates that in both experimental groups, the mean scores of components and the total emotional creativity score increased in the post-test and follow-up stages. In contrast, similar changes were not observed in the control group during these stages. In this study, to test the hypothesis of normal distribution of data, Shapiro-Wilk values related to the components and total emotional creativity score for all three groups were examined in three stages: pre-test, post-test, and follow-up.

Moreover, the Shapiro-Wilk value for the emotional preparedness component in the cognitive-social training group (p=0.026) and in the critical thinking group (p=0.041) at the post-test stage, innovation in the critical thinking group at the follow-up stage (p=0.039), and honesty in the cognitive-social training group at the pre-test stage (p=0.031) and the same component in the critical thinking group at the

post-test stage (p=0.042) were significant. Although this indicates a non-normal distribution of these components in the mentioned groups and stages, considering the significance level obtained for the Shapiro-Wilk index and the resilience of variance analysis statistical tests against deviations from assumptions, it can be expected that this degree of deviation from the assumption does not invalidate the analysis results.

In this study, the homogeneity hypothesis of error variances was assessed using Levene's test, and the results showed that the hypothesis is valid for the components and total emotional creativity score among the data. Subsequently, the homogeneity hypotheses of the covariance matrices of dependent variables were examined using Box's M test and the sphericity condition using Mauchly's test, the results of which are presented in Table 4.

Table 4. The results of Levene and Mauchly tests

Variable	Box's M			Mauchly		
	Statistics	F	p	Statistics	χ^2	p
Preparedness	8.80	0.69	0.754	0.996	0.42	0.811
Innovation	19.79	1.57	0.092	0.979	2.02	0.364
Effectiveness	12.20	0.97	0.475	0.940	5.81	0.055
Honesty	15.32	1.22	0.263	0.994	0.58	0.750
Total	17.15	1.36	0.175	0.968	3.02	0.221

Table 4 indicates that Box's M statistic is not significant for any of the components and the total emotional creativity score. This suggests the establishment of the homogeneity hypothesis of covariance matrices of dependent variables among the data. Additionally, Table 4 shows that the chi-square value derived from Mauchly's test for none of the components and the total emotional creativity score is significant, indicating that the sphericity

hypothesis for the levels of the dependent variable was valid.

After evaluating the hypotheses for analysis and ensuring their validity among the data, the hypotheses were tested using the repeated measures analysis of variance method. Table 3 shows the results of the multivariate analysis in comparing the effect of cognitive-social training and critical thinking on the components and total emotional creativity score.

Table 5. The results of multivariate test

Dependent variable	Wilks' Lambda	F	df	P	η^2	Power
Preparedness	0.682	9.92	4,188	0.001	0.174	1.00
Innovation	0.826	4.70	4,188	0.001	0.091	0.947
Effectiveness	0.597	13.84	4,188	0.001	0.227	1.00
Honesty	0.757	7.00	4,188	0.001	0.130	0.994
Total	0.567	15.43	4,188	0.001	0.247	1.00

The independent variables significantly impacted the components of preparedness (Wilks' Lambda = 0.682, η^2=0.174, p=0.001, F=9.92), innovation (Wilks' Lambda = 0.826,

η^2=0.091, p=0.001, F=4.70), effectiveness (Wilks' Lambda = 0.597, η^2=0.227, p=0.001, F=13.84), honesty (Wilks' Lambda = 0.757, η^2=0.130, p=0.001, F=7.00), and the total

emotional creativity score (Wilks' Lambda = 0.567, η2=0.247, p=0.001, F=15.43). Subsequently, Table 4 presents the results of the repeated measures analysis of variance in explaining the effect of implementing cognitive-social training and critical thinking on the components and total emotional creativity score.

Table 6. The results of analysis of variance with repeated measurements						
Variable	Effect	SS	MS	F	P	η^2
Preparedness	Group	917.38	1604.41	27.16	0.001	0.364
	Time	877.40	1540.45	54.11	0.001	0.363
	Group*Time	739.89	3248.89	10.82	0.001	0.185
Innovation	Group	2696.63	6160.27	20.79	0.001	0.304
	Time	3435.39	6334.18	51.49	0.001	0.352
	Group*Time	1292.38	11078.25	5.54	0.001	0.104
Effectiveness	Group	850.79	1121.53	36.03	0.001	0.431
	Time	641.18	1140.53	53.41	0.001	0.360
	Group*Time	663.99	1833.01	17.21	0.001	0.266
Honesty	Group	255.28	882.84	13.74	0.001	0.224
	Time	287.46	779.50	35.03	0.001	0.269
	Group*Time	253.78	1485.46	8.12	0.001	0.146
Total	Group	16149.56	12722.37	60.30	0.001	0.559
	Time	17013.66	14290.70	113.10	0.001	0.543
	Group*Time	10386.84	24485.41	20.15	0.001	0.298

Table 6 shows that in addition to the group effect and time effect, the interaction effect of group × time for the components of preparedness ($\eta2=0.185$, $p=0.001$, $F=10.82$), innovation ($\eta2=0.104$, $p=0.001$, $F=5.54$), effectiveness ($\eta2=0.266$, $p=0.001$, $F=17.21$), honesty ($\eta2=0.146$, $p=0.001$, $F=8.12$), and the total emotional creativity score ($\eta2=0.298$, $p=0.001$, $F=20.15$) is significant. These findings indicate that the implementation of independent variables significantly influenced the components and the total emotional creativity score. Continuing, Table 5 shows the results of the Bonferroni test for the scores related to the components and total emotional creativity score across three groups and three stages of implementation.

Table 7. The results of Bonferroni post-hoc test					
Variable	Stage		Mean diff.	S.E	p
Preparedness	Pre-test	Post-test	-3.65	0.61	0.001
	Pre-test	Follow-up	-4.23	0.58	0.001
	Post-test	Follow-up	-0.58	0.59	0.974
Innovation	Pre-test	Post-test	-8.16	1.06	0.001
	Pre-test	Follow-up	-8.37	1.17	0.001
	Post-test	Follow-up	-0.22	1.04	1.00
Effectiveness	Pre-test	Post-test	-3.54	0.41	0.001
	Pre-test	Follow-up	-3.62	0.40	0.001
	Post-test	Follow-up	-0.08	0.42	1.00
Honesty	Pre-test	Post-test	-2.91	0.41	0.001
	Pre-test	Follow-up	-2.42	0.41	0.001
	Post-test	Follow-up	0.49	0.38	0.611
Total	Pre-test	Post-test	-18.26	1.60	0.001
	Pre-test	Follow-up	-18.64	1.75	0.001
	Post-test	Follow-up	-0.37	1.51	1.00
Variable	Groups		Mean diff.	S.E	p
Preparedness	CST	CTT	2.23	0.59	0.001
	CST	Control	4.34	0.59	0.001

	CTT	Control	2.11	0.58	0.001
Innovation	CST	CTT	3.20	1.15	0.020
	CST	Control	7.41	1.15	0.001
	CTT	Control	4.21	1.14	0.001
Effectiveness	CST	CTT	1.93	0.49	0.001
	CST	Control	4.17	0.49	0.001
	CTT	Control	2.24	0.48	0.001
Honesty	CST	CTT	0.77	0.44	0.239
	CST	Control	2.25	0.44	0.001
	CTT	Control	1.48	0.43	0.001
Total	CST	CTT	8.12	1.66	0.001
	CST	Control	18.16	1.66	0.001
	CTT	Control	10.04	1.65	0.001

The Bonferroni test in comparing the time effect in Table 5 shows that the difference in mean scores of components and total emotional creativity score between the pre-test-post-test and pre-test-follow-up stages is statistically significant, but the difference in mean scores between the post-test-follow-up stages is not significant. Moreover, the results of the Bonferroni test in comparing group effects in Table 5 show that the difference in mean scores of components and total emotional creativity score between the cognitive-social training group and the critical thinking training group compared to the control group is statistically significant. Specifically, the implementation of cognitive-social training on one hand and critical thinking training on the other hand has caused an increase in the mean scores of components (except for the honesty component) and the total emotional creativity score in the post-test and follow-up stages compared to the pre-test stage. Consistent with the results related to group effects in the Bonferroni test, the trend of changes in mean scores of components and total emotional creativity score in the diagrams of Figure 1 shows that the changes resulting from cognitive-social training and critical thinking training on the components and total emotional creativity score have remained after the end of the course. The results of Table 5 showed that the difference in the effect of the two methods of cognitive-social training and critical thinking on the components of preparedness (p=0.001), innovation (p=0.020), effectiveness (p=0.001), and total emotional creativity score (p=0.001) is significant. Such that cognitive-social training compared to critical thinking training has caused a greater increase in the mean scores of components (except for the honesty component) and the total emotional creativity score. Based on this, it can be said that there is a significant difference between the effectiveness of cognitive-social training and critical thinking in emotional creativity among female middle school students, with cognitive-social training being a more effective method for increasing emotional creativity in female middle school students compared to critical thinking training.

Conclusion

This research was conducted to determine the effectiveness of critical thinking and cognitive-social training on the emotional creativity of female middle school students. The study's findings show that in both experimental groups, the average scores for components and the total score for emotional creativity increased in the post-test and follow-up stages. In contrast, similar changes were not observed in the control group. Moghanloo (2022) found a significant and positive relationship between sensory processing sensitivity and emotional creativity in female students (Moghanloo, 2022). Valikhani and colleagues (2017) demonstrated a positive correlation between emotional creativity and critical thinking (Valikhani et al., 2017). Critical thinking was shown to increase the desire for learning in the experimental group compared to the control group. Individuals with emotional creativity are able to establish social relationships, create a safe and secure environment for themselves, and effectively listen and respond to the views and opinions of others, which is likely to positively influence their development in critical thinking (Seifouri, 2009). Studies by Jouldam et al. (2001), Shokar et al. (2002), and Miflin (1992) have shown similar results to this study. Elhamifar (2019) found significant differences between the average scores of internal and external goal orientations in the experimental and control groups in the post-test phase (Elhamifar, 2019). Demirchi (2016) demonstrated that cognitive-social-emotional skill training had a significant impact on emotional cognitive regulation (Demirchi, 2016). Kimiaei et al. (2011) showed that emotional skill

training increases the ability to identify and manage emotions (Kimiaei et al., 2011). Ratcliffe et al. (2014) found that social-emotional skill training enhances emotional-affective skills (Ratcliffe et al., 2014). Donald (2014) indicated that social competence training increased skills like self-awareness, empathy, interpersonal communication, emotional coping, decision-making, and social problem-solving (Donald, 2014). The results of these studies are consistent and show similar findings.

The current study found significant results for the component of emotional preparedness in both the cognitive-social training and critical thinking groups in the post-test phase, innovation in the critical thinking group in the follow-up phase, and honesty in the cognitive-social training group in the pre-test phase and the same component in the critical thinking group in the post-test phase. A study in South Korea on the effectiveness of social skill training and parental training on preschool children's aggression problems showed that cognitive-social skill training was effective in reducing aggression and increasing self-control in students, which also impacts the development of children's social skills (Kim et al., 2011).

In this study, Box's M statistic was not significant for any of the components or the total emotional creativity score, indicating the establishment of the homogeneity hypothesis of covariance matrices of dependent variables in the data. Moghanloo's study found a significant positive relationship between family communication patterns in the context of discussion and emotional creativity in female students (Moghanloo, 2022). Mahboobi Pour (2022) found that emotional creativity inversely relates to academic anxiety and predicts academic anxiety in high school girls (Mahboobi Pour, 2022). Isa Zadegan et al. (2013) stated that there is a significant relationship between emotional creativity and general health, particularly in the dimensions of correlation and preparedness (Isa Zadegan, 2013). Studies by Elton (2003) and Wong and Ahmad (2003) also showed that individuals scoring high on emotional creativity scales have better psychological health. These results differed from the current study, possibly due to differences in the statistical population, timing of the research, and other variables.

The current study's results showed that in addition to the group effect and time effect, the interactive effect of group × time for components of preparedness, innovation, effectiveness, honesty, and the total emotional creativity score was significant. Andolina (2001) believes that critical thinking is recognized as a fundamental skill for rational participation in a democratic society and is supported and emphasized in the modern world as a necessary skill (Andolina, 2001). In the study by Mohammadi Far and colleagues, cognitive-behavioral interventions were effective in reducing exam anxiety (Mohammadi Far, Yasemini & Najafi, 2018). Furthermore, in this study, the difference in average scores for components and total emotional creativity score was statistically significant between the pre-test-post-test and pre-test-follow-up stages, but the difference in average scores between the post-test-follow-up stages was not significant. In the study by Bahrami and colleagues, it was stated that critical thinking training impacts students' academic self-efficacy and learning styles (Bahrami & Asgharnejad, 2020). Carroll and colleagues in their research stated that self-efficacy positively correlates with students' academic performance (Carroll et al., 2009). In the study by Moghanloo and colleagues (2020), a significant difference existed between the average post-test scores of constructive thinking strategies and self-efficacy in the control group and the average post-test scores of constructive thinking strategies and self-efficacy in the experimental group (Moghanloo et al., 2020).

Critical thinking, through analysis, evaluation, and skilled reconstruction of thought, improves and strengthens thinking, enabling learners to distinguish correct from incorrect, real from unreal, and deep opinions from superficial ones (Bahrami & Asgharnejad, 2020). One of the psychological constructs that can contribute to the development of critical thinking is emotional creativity. Studies have shown that both critical thinking and emotional creativity are teachable. Therefore, by teaching emotional creativity, which is related to many psychological constructs such as cognitive creativity, interpersonal and intrapersonal relationships, and personality, and focusing on the component of effectiveness/validity, which refers to the ability to effectively and clearly express one's emotions, not only can the educational problems of students and the traditional Iranian educational system, which suffer from a lack of creativity and critical thinking leading to stagnation, imitation, and replication of Western results, be somewhat improved, but also many problems arising from the inability to

communicate with oneself and others, frequently found in students, can be reduced, including issues such as anxiety, depression, and in some cases, suicide (Valikhani et al., 2017).

In the current study, the results showed that the impact of two methods of cognitive-social training and critical thinking on the components of preparedness, innovation, effectiveness, and the overall score of emotional creativity is significant. Cognitive-social training, compared to critical thinking training, led to a greater increase in the average scores of these components (except for the honesty component) and the overall emotional creativity score. Moghanloo's study (2022) showed that lower sensory thresholds, along with family communication patterns in discussion, had the most significant impact on emotional creativity in students (Moghanloo, 2022). Self-management characteristics in the process of self-directed learning shape learners' controlled freedom, choice, and responsibility. Velykhani et al. (2017) indicated that critical thinking has a significant and positive relationship with the effectiveness/validity and preparedness components of emotional creativity (Velykhani et al., 2017). Najafi Fard and colleagues (2021) stated that there was a significant difference in all components from pre-test to post-test and in the pairwise comparison of pre-test and follow-up, indicating the effectiveness of the Adlerian cognitive-social program over time (Najafi Fard, 2021).

This research, like any study, faced limitations. The sample included only female middle school students from Sabzevar, thus the findings cannot be generalized to all students or other regions. The study was conducted over a limited time period, with follow-ups occurring only one month after the end of the training courses, hence the long-term effects were not assessed. This study was quasi-experimental and might not be as precise as a fully experimental research. It employed a questionnaire to measure emotional creativity, which might not cover all aspects of emotional creativity. Therefore, the results of this research might only be applicable under specific educational and cultural conditions in a particular geographical area.

Educators and teachers need to understand that one of the key goals in education in today's turbulent and variable environment is to learn methods of emotional creativity and innovation. To achieve this, students can be habituated to thinking through education, allowing this thought process to permeate various layers of schools and have a lasting and overall impact on the implementation of school strategies. Modern schools, due to various advancements in sciences and simultaneous changes in educational goals, have focused more on transferring scientific information and facts. However, with the advent of the post-industrial and information age, characteristics like the explosion of knowledge, rapid transformation and change in scientific findings, the presence of smart machines in education, and most importantly, the uncertainty of scientific knowledge, mean that not only is it impossible to transfer all scientific findings, but there is also no perceived need for it. Consequently, education specialists and curriculum planners recommend fostering and strengthening scientific methods and attitudes instead of transferring scientific facts, emphasizing the process rather than the reproduction of scientific facts. They believe that students should focus on the method of acquiring scientific facts rather than acquiring the facts themselves and learn how to think independently, make decisions, and judge various matters. In the educational process, students should be able to enhance and develop sensory perception, understanding of different theories, and their critical and scientific thinking.

Conflict of Interest

According to the authors, this article has no financial sponsor or conflict of interest.

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