

Full Length Research Paper

The effect of a teacher professional development in facilitating students' creativity

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The Iranian educational system would benefit from major refinement in order to better develop the creativity of children. The extension of teachers' understanding of creativity is one of the main factors in facilitating change. A theory and practice based professional development program was designed, therefore, to assist teachers to acquire knowledge, attitudes and skills associated with improved student creativity. In this research, the effect of creativity-oriented teaching on students' creativity was examined using the Solomon four-group design method. The teachers and students were divided in experimental, treatment and control groups. The control group was further subdivided into two groups. Students from the experimental and one control group were pre-tested using the Torrance test of creative thinking (TTCT). Teachers of the experimental group and treatment group completed a creativity training program and then used the techniques demonstrated with their students. Following the intervention, students of each of the experimental, treatment and control groups completed the TTCT a second time and the teachers completed a creativity checklist questionnaire for each student. The results indicated that teachers' involvement in the training program had a positive effect on the creativity of their students. These results provide basic evidence that teacher professional development programs associated with the improved understanding of creativity-oriented techniques can make a positive contribution to development of Iranian students' creativity.

Key words: Creativity, teaching, professional development.

INTRODUCTION

Creativity has been defined in many contexts, but can be simply described as "successful personal activity intent on producing an appropriate new idea or object" (Newton and Newton, 2009: 45). Within the domain of student learning, teachers can serve as facilitators or inhibitors of creativity and therefore, play an important role in the development of creative skills within the educational system (Sternberg, 2003). At the classroom level, the incorporation of teaching practices that promote creativity can lead to positive changes in student behaviour, social skills, self-esteem, motivation and academic achievement

(Qualifications and Curriculum Authority, 2005). To maximise student outcomes in relation to creative endeavour it is critical that teachers receive appropriate knowledge and training in relation to appropriate classroom techniques.

TEACHING AND CREATIVITY

Sternberg in his critique of creative thinking in the classroom stated that: "Teachers who reward all kinds of creativity are those who are likely to find among their students those who have made one of the most important decisions a person can make in his or her life: the decision to be creative" (2003: 337). In light of this, a

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number of studies have been undertaken with a focus on assessing the knowledge of teachers in regards to creativity and the effect of teaching characteristics on student creativity. Previous findings have shown that teachers have a limited understanding of creativity (Fryer and Collings, 1991; Gallager, 1985; Hosseini, 2002; Kampylis et al., 2009; Torrance, 1972). According to Kampylis et al. (2009) further research is needed in order to evaluate teachers' perceptions regarding creativity, to better understand and classify the specific needs of teachers to facilitate students' creative potentials.

Torrance (1990) is another proponent of the view that the teacher is a critical factor in increasing student creativity. The study of Hosseini (2002) showed that the provision of information to teachers regarding alternative educational structures focusing on creativity promoted changes in knowledge and attitudes that resulted in the incorporation of new skills suited to the development of student creativity. Furthermore, the interview responses of the 70 Iranian primary teachers indicated that 90% of the sample believed that undertaking a creativity-oriented professional development program had a positive outcome on their knowledge; attitude and skills changed their view of creativity and prompted changes in their work practices. The teachers commented that: 'the students participate in classroom and classroom activity with stronger motivation'. It was also suggested that completion of a teaching course focusing on creativity lead to their classes becoming student-centered and directed toward activities of high interest to the learner. Teaching and as a consequence learning, was perceived to be more successfully accomplished and contributed to an improvement in the educational progress of their students. Park et al. (2006) collected interview data from 35 Korean science teachers' regarding their perceptions of creativity and science teaching after participating in an overseas professional development program. Results indicated that the teachers developed a stronger awareness that creativity can be expressed by every student and that creativity can be enhanced. In general, research has shown that teachers who maintain positive relationships, with a genuine interest in and respectful acceptance of student skill levels, are effective in the development of creativity (Sternberg and Williams, 1996). Teachers are more capable of promoting creativity in their students if they acquire an improved understanding of the concept themselves (Seo et al., 2005). Knowledge of creative thinking assists in the establishment of a creative atmosphere in classroom, improved learning and in the formulation of positive attitude towards their students. Teachers' deeper understanding of creativity will facilitate the development of strategies for enhancing creativity and the creation of educational programs that focus on creativity (Murdock, 2003; Slabbert, 1994). Mack (1987) surveyed 62 teacher educators and 388 student teachers from ten teaching institutions regarding their opinions in relation to the importance of using creative approaches were incorporated in their courses.

Mack reported that both groups supported the inclusion of creativity education methods in teacher preparation programs. However, more than half of the individuals in the sample reported that they have not participated in any creativity oriented training. Mack concluded that in many teacher education programs there is no emphasis on knowledge associated with methods to increase creativity. McDonough and McDonough (1987) suggested that a limited number of faculties and universities in America have managed to include subjects related to creativity education in their courses. Fasko (2001) concluded that it is important to maintain a focus on creativity within university teacher education, to facilitate the development of curiosity, creativity and innovation with the school system. Overall, the promotion of creativity in children is very important and that it would be valuable for both pre-service and in-service teachers to participate and complete some form of creativity education course.

CREATIVITY AND TEACHER PROFESSIONAL DEVELOPMENT

According to Blumen-Pardo (2002), factors related to school operations and teaching practices have an important effect on student functioning in developing countries. Skilled teachers who have had opportunities to undertake a broad educational program tend to be effective in the promotion of moral development, educational progress and cognitive growth within students who demonstrate high or low learning capacities. Blumen-Pardo recommends a program of continuing education for teachers in relation to creativity, especially in developing countries. Pre-service teachers can also benefit from additional training within programs such as the higher education in the arts program (HEARTS) that focus on an improved understanding of the contribution that practices associated with creativity can make within the education system (Downing et al., 2007).

Several studies have shown that as an outcome of professional development teachers are capable of facilitating change in the creativity skills of their students. Laius and Rannikmäe (2004) found a significant difference in the creativity subscale scores of the Instrument Package User's Guide (1997) of the Iowa Chautauqua Program for a sample of 447 students assessed at pre- and post-test points separated by an 8 week interval. The intervention involved 13 teachers completing a training program designed to develop their science teaching skills in which an important focus was on fostering student creativity. The researchers concluded that the training program prompted the teachers to encourage students to identify meaningful causes and outcomes that are considered as critical elements in nurturing creativity. Blumen-Pardo (2002) used the test for creative Thinking-drawing production (TCT-DP) to evaluate changes in the creativity scores of a sample of

231 second-graders. From this sample, 130 Peruvian children were involved in the experimental group and 101 in the control group. The first element of the intervention constituted 40 second-grade teachers completing an in-service teaching training workshop on student giftedness in which creativity skills were of particular emphasis. Students in the experimental groups then completed a 10 week program involving four lessons specifically devoted to developing skills such as comprehension, convergent problem solving and memory. Results clearly indicated a significant difference in figural-creative performance between the groups. Blumen-Pardo concluded that these findings represented strong evidence that teacher training programs that include a focus on creativity should receive greater attention in the professional development of teachers, particularly in developing countries. As an outcome of the examination of the literature and research the hypotheses of the current study are that:

1. Teachers participation in a program focusing on educational creativity and the subsequent implementation of strategies promoted in the training with their students, will result in their students achieving higher Torrance test of creative thinking scores when compared to similar control groups' TTCT scores.
2. Teachers participation in a program focusing on educational creativity and the subsequent implementation of strategies promoted in the training with their students will result in these teachers scoring their students higher on a teacher rated creativity checklist than teachers who complete the creativity checklist for the students in the control groups.

METHODOLOGY

Research design

The study is part of the overall evaluation of the creative training for teachers program offered to teachers in Tehran, Iran. In this phase of the research, the effect of creativity-oriented teaching on students' creativity was examined using a semi-experimental approach that incorporated the Solomon four-group design (Ary et al., 2006).

Participants

The study utilized random cluster sampling. There are 20 school districts located in Tehran, from which 10 elementary schools, 2 from each of the North, South, East, West and Central areas were randomly selected. A sample of 120 teachers were also randomly selected at the school level from the 10 schools and again at the school level divided evenly into experimental, treatment and control groups. The number of teachers involved at each school varied depending on the size of the student population. The sample of 600 students, aged 7 - 11 years, was drawn from the cohort of students that the teachers involved in the study were teaching.

Thus, a total of 60 teachers were involved in the experimental and treatment groups, which also included a cohort 300 students resulting from the random selection of five students who worked with each teacher. The same procedure was followed in the

formation of the control groups. Finally, on the basis of the Solomon method, 150 students of the experimental group and 150 students of one control group received pre-test and post-test, whereas another 150 students of the treatment group and 150 students of the other control group received only the post-test.

Creativity training program

The teachers in the experimental groups participated in a creativity focused professional development workshop. The 70 h program included 20 h assigned to detailing theory, 15 h relating to teaching techniques and 35 h associated with classroom practices. The workshops required participant involvement for 5 h per week for approximately four months. Each program participant was provided with specific information and strategies examining: (a) the concept and nature of creativity (b) the methodology of teaching creativity (c) creativity and school education and (d) a model of creativity development (Hosseini, 2002; 1998). Teachers linked their participation in training with the implementation of the material covered in the workshops in their classroom. In the next session they would receive feedback from the program coordinator and review their achievements and concerns in relation to the incorporation of the teaching strategies associated with the promotion of creativity in their classes (Hosseini, 2002; 1998).

In the model of classroom based creativity development, the main aim is the advancement of teacher's professional skills to establish a creative learning environment. The program addresses the areas of emotion, society, cognition, thinking and teaching and examines how these characteristics influence the creative development of children. Within the practice aspect, the focus is on the encouragement of the creative potential of students based around the educational programs in which they are currently involved. In the emotional-cognitive aspect, teaching approaches are considered, and it encourages imagination, curiosity and risk-taking. The environmental social aspect allows students to appraise the ideas of freedom, safety and respect in relation to their learning in which there is no competition and formal evaluation. The thinking component of the workshop is directed toward creative development, where the teacher shows respect for unusual ideas and encourages flexibility and innovation in their students. Teachers familiarize themselves with the methodology of creative teaching and put it into practice. Each of the key areas of the model is taught in one or two workshops and is supported by the complementary application of the theme by the teachers in their own class.

Instrumentation

The dependent variables used in this phase of the research were the Torrance test of creative thinking and creativity checklist.

Torrance test of creative thinking (TTCT)

The main purpose of choosing the TTCT is the practicability and validity of the measure and its frequent use in psychological and educational evaluations of creativity (Baer, 1993; Kim, 2006). The test includes figural and verbal subtests, of which the figural forms were used in the present study and are preferable to use from pre-school levels up to high school. The TTCT-Figural consists of parallel A and B forms with three subtests: (a) compose a drawing (b) finish a drawing and (c) compose a different drawing parting from parallel lines (Torrance, 1974). Both forms are oriented to evaluate four main cognitive processes of creativity: (a) fluency or number of relevant responses (b) flexibility as referred to a variety of categories or shifts in responses (c) originality entails considering novelty responses, not familiar and unusual, but relevant and

Table 1. Means and Standard Deviations for Post-test TTCT scores.

Test group	Teaching group	M	S.D	n
No pre-test	Treatment	96.46	29.87	139
	Control 2	44.67	21.74	144
	Total	79.26	36.71	283
Pre-test	Experimental	102.04	32.15	101
	Control 1	74.77	26.92	114
	Total	87.85	32.43	215
Total	Experimental and treatment	98.41	30.75	290
	Control 1 and 2	61.61	28.87	208
	Total	82.85	35.14	498

(d) elaboration as referred to the number of details used to extend a response. According to the TTCT-Figural Manual of 1998 (Torrance, 1998), the reliability estimates of the creative index from Kuder-Richardson 21 using 99th percentile scores as the estimates of the number of items ranged between 0.89 and 0.94. The TTCT-Figural Manual of 1990 (Torrance, 1990) states that the interpreter reliability among the scorers was greater than 0.90. Khaefi (1993) measured the reliability of the Iranian version of the TTCT, Figural A and B. He reported the test-retest reliability of TTCT Figural B subscales were: fluency (0.78), elaboration (0.91), flexibility (0.81), originality (0.74) and overall test score (0.80).

Creativity checklist

The creativity checklist (CCh) (Johnson, 1979), the primary reason for the selection of the CCh was the availability of an Iranian version that could be used in conjunction with the TTCT. The CCh was created in relation to Torrance's components of creativity including fluency, flexibility, resourcefulness, constructional skill, ingenuity, independence, and positive self-referencing behaviour. The CCh incorporates eight-items designed to measure the systematic identification of overt creativity based on direct observation. Each item is rated on the basis of that person's evaluation of the creativity behaviours the individual demonstrates and are scored on a scale that can vary from 1 = never to 5 = consistently. Each individual's total creativity score is obtained by summing across all eight items. Total CCh scores may range from a minimum of 8 to a maximum of 40. In using the CCh, every effort should be made to observe and evaluate students in as many settings and content/task areas as possible in which creativity is demonstrated and can be observed. The Cronbach's alpha coefficient for the CCh was $r = 0.98$ and a positive correlation, $r = 0.51$, was also found between the TTCT and CCh in the current study. Johnson (1979) reported a correlation with the TTCT of $r = 0.56$.

Data collection procedure

Data collection was undertaken in the schools and involved a pre- and post-test interval of between 28 and 30 weeks, depending on student and teacher availability. The students completed TTCT Figural form A in the pre-test and Figural form B in the post-testing. An administrator familiar with the measure administered post-testing for the student dependent measure to groups of five

students in a setting within the school. Teachers completed the observational checklist at convenient opportunities after their students had completed the post intervention TTCT.

Data analyses

According to Solomon design methodology, the experimental group is involved in all phases of treatment and testing. The experimental group and one control group complete pre-testing and another pair of treatment and control groups are not pre-tested. Following pre-testing the experimental group and a treatment group completed and implemented the creativity training program. Finally, all student and teacher participants completed post-testing. The data collected were analysed using the statistical package for social science (SPSS). Two-factor analysis of variance (ANOVA) was used to test for the effects of pre-testing, teacher involvement in creativity training and the interactive effect of pre-testing and intervention outcomes on the dependent variables of the students' TTCT scores and the teachers' CCh scores.

RESULTS

Hypothesis 1

Descriptive results for all groups' post-test scores on the TTCT are shown in Table 1. The total mean of post-test creativity score of the no pre-test group ($m = 79.26$), was smaller than pre-test group ($m = 87.58$). The total mean post-test score of experimental groups ($m = 98.41$), was greater than the mean total control groups' score ($m = 61.16$).

Table 2 shows the results of the two-way analysis of variance for the students' post-test TTCT scores. The main effect of the students participation in pre-testing was significant ($F_{(1,494)} = 21.578, p < 0.001$). There was also significant main effect for teacher involvement in creativity training in regards to the students ($F_{(1,494)} = 22.477, p < .001$). Finally, the interaction of student involvement in pre-testing and teacher involvement in creativity training in relation to the students' TTCT post-test scores was significant ($F_{(2,494)} = 10.804, p < .001$).

Table 2. Two-factor ANOVA for post-test TTCT scores.

Source	SS	df	MS	F	Sig
Pre-test effect	36802.934	1	36802.932	21.578	<0.001
Creativity training	180697.486	1	180697.498	22.477	<0.001
Pre-test x training effect	17372.391	2	8686.202	10.804	<0.001
error	397138.631	494	803.923		
Total	613869.597	497			

a. R squared = 0.353 (Adjusted R squared = 0.349).

Table 3. Means and standard deviations for post-test creativity checklist scores.

Test group	Teaching group	M	S.D	n
No pre-test	Treatment	34.10	4.71	143
	Control 2	31.16	9.05	135
	Total	33.10	6.66	278
Pre-test	Experimental	32.35	8.10	94
	Control 1	31.53	9.21	114
	Total	31.90	8.71	208
Total	Experimental and treatment	33.50	6.12	277
	Control 1 and 2	31.36	9.12	209
	Total	32.58	7.62	486

Hypothesis 2

Descriptive results for all groups' post-test scores on the CCh are shown in Table 3. The total mean post-test checklist score for the groups with no pre-test ($m = 33.10$) was higher than the pre-test groups mean score ($m = 31.90$). The total mean checklist score of experimental groups ($m = 33.50$) was higher than the mean score of control groups ($m = 31.36$).

Table 4 shows the results of the two-way analysis of variance for the students' post-test CCh scores. The main effect of the students participation in pre-testing was not significant ($F_{(1,482)} = 0.925$, $p = 0.330$). There was, however, significant main effect for teacher involvement in creativity training in regards to the students CCh post-test scores ($F_{(1,482)} = 6.977$, $p = 0.009$). Finally, the interaction of student involvement in pre-testing and teacher involvement in creativity training in relation to the students' CCh post-test scores was not significant ($F_{(2,482)} = 1.113$, $p = .136$).

DISCUSSION

The results of this phase of the study clearly demonstrated that the students in the experimental and treatment groups were significantly higher in creativity, as

assessed by TTCT scores, in comparison to the control groups. The creativity training program that the experimental and treatment groups of teachers completed could be considered as a contributing factor in the positive change in creativity scores of their students. Therefore, the first hypothesis of research is accepted. Additionally, the sample of students that completed TTCT pre-testing was also higher in post-test TTCT scores than the group of students that only completed post-testing. This result indicates that students may become familiar with the items of the TTCT as an outcome of completing the measure and that this experience may in turn have a positive effect on the students' post-test TTCT scores. A significant interaction effect of the students completion of TTCT pre-testing and participation in the creativity intervention was also observed.

In order to demonstrate convergent validity of the change in the students' TTCT scores as an outcome of the teachers participation in creativity training, the CCh was also completed by the teachers for students in the experimental, treatment and control groups. The results indicated that students in the experimental and treatment groups scored significantly higher on the post-test creativity checklist. No significant difference was found between the pre-test and non pre-test groups in regards to their teacher creativity checklist scores. Results associated with the moderate correlation between the

Table 4. Two-factor ANOVA for post-test teacher checklist scores.

Source	SS	df	MS	F	sig
Pretest effect	54.277	1	54.276	0.925	0.330
Creativity training	347.534	1	347.534	6.977	0.009
Pre-test x training effect	126.893	2	63.445	1.113	0.136
error	27464.118	482	56.986		
Total	28207.702	485			

a. R squared = 0.026 (Adjusted R squared = 0.020).

TTCT scores and the teacher observational checklist indicates that teachers can generally evaluate the creativity skills of their students. The differences identified between the experimental, treatment and control groups in relation to the checklist scores also reinforces that the creativity training program was effective in facilitating change in teacher practices and as a consequence students creative skills. Furthermore, the lack of difference in the checklist scores for the pre-test and no pre-test groups suggests that the pre-test experience involving the TTCT was not a contributing factor in the post-test scores based on the teachers observations of student creative behaviors. The checklist scores may possibly relate to teacher knowledge and not directly to the scored creativity skills of the students.

The teachers of the experimental and treatment groups may have become familiar with the characteristics of the checklist questions as an outcome of their professional development and, thus, were better informed to answer the checklist questions with a greater awareness of creative skills. The results also support the proposition of Proctor and Burnett (2004) that a creativity checklist based on teacher observation represents a valuable tool to monitor their students' real-world creativity characteristics applicable to the classroom situation. The results of this research in relation to the students' TTCT scores are similar to the findings of Blumen-Pardo's (2002) study conducted with students in Peru. Blumen-Pardo reported that the creativity professional development program for teachers facilitated an increase in students' creative capability and concluded that teacher training workshops were necessary to develop the creative performance of students. Poon Teng Fatt (2000) also emphasized the necessity for teacher training as a key element to foster creative thinking in their students. Sternberg and Williams (1996) proposed the application of patterns of creativity education as an effective strategy to implement in order to develop the students' creativity. Firstly, teachers have to educate students on how to function as a creative person and make them aware of the process of creativity. They should then guide students on a path through which they are able to build their own creativity as the next element in the pattern. The professional development program implemented in the current research clearly influenced the teachers' capacity to apply new knowledge

and skills within their classroom practices that facilitates the development of student creativity. According to the results of this research, the framework of creativity training (Hosseini, 2002) and its educational implementation can be introduced as an effective and suitable pattern to develop of the creativity of students. Park, Lee, Oliver and Cramond (2006) also strongly support the important role that teacher professional development courses that focus on creativity have in "facilitating meaningful changes in teachers' beliefs and the changes in beliefs that may lead to changes in their teaching practices" (p. 40). The current findings provided a clear indication that students' creative thinking skills are capable of being positively affected as an outcome of the participation of teachers in quality training.

CONCLUSION

Teachers play an integral role in the education system in general. When they are provided with the opportunity to commit to professional development programs that make strong connections with theory, research and practice they are better prepared to influence the knowledge and skills of their students in a positive manner. Creativity is one such area, particularly in countries such as Iran, where educational change and restructure is an important priority. Teaching practices are changing rapidly in Iran and can benefit from the inclusion of training programs that have a strong vision of creativity and a clear understanding of the future implications of these changes for students (Oral, 2006).

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