

Effects of a program for developing creative thinking skills

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Abstract

Introduction. The aim of this study is to present an intervention program for creative skills development applied to a group of students of lower Secondary Education.

Method. This program was applied in a school in Zaragoza (Spain) during the 2008-09 academic year. The study used a repeated-measures, quasi-experimental design with non-equivalent control group. The sample included 48 participants, ages 13-14 (24 experimental and 24 control participants). Three assessments were taken, before and after administering the program: the Torrance Test of Creative Thinking (TTCT) was applied as a pretest and posttest in its parallel forms, and the Test of Creative Imagination for Young Children (PIC-J) was applied as a follow-up test to improve the reliability of the intervention. The program consisted of weekly 50-minute structured sessions with their objectives, activities and evaluation criteria.

Results. ANOVA results showed that development of verbal and figural creativity in the experimental group was significantly higher ($p < .05$) than in the control group. Verbal creativity development was higher than the figural.

Conclusion: The results of this study suggest that, in order to improve the educational effects of creative skill development, creative development should be incorporated into the objectives through the teaching and learning process of the educational methodology. This aspect highlights the importance of preparing the trainee teacher in creative thinking skills.

Keywords: Creativity; Creative Thinking; Teaching-learning process; Educational methodology; Intervention program; Secondary Education.

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Efectos de un programa para desarrollar las habilidades creativas

Resumen

Introducción. El objetivo de este estudio es presentar los resultados obtenidos de un programa de intervención para el desarrollo de las habilidades creativas en un grupo de estudiantes de segundo curso de Educación Secundaria Obligatoria (ESO).

Método. El programa se ha implementado en un colegio de la ciudad de Zaragoza (España) durante el curso académico 2008-09. El estudio ha seguido un diseño cuasi-experimental de medidas repetidas con grupo control no equivalente. La muestra del estudio estuvo compuesta por 48 participantes de entre 13-14 años (24 del grupo experimental y 24 del grupo de control) mediante un tipo de muestreo “de oportunidad o comodidad”. Antes y después del programa se administraron tres pruebas: el Test de Torrance de Pensamiento Creativo (TTCT) como prueba inicial y final y; la Prueba de la Imaginación Creativa para Jóvenes (PIC-J) como prueba de seguimiento. El programa consistió en una serie de sesiones semanales de 50 minutos estructuradas por sus objetivos, actividades y criterios de evaluación.

Resultados. Los resultados del programa, evaluados a través del ANOVA, mostraron que el programa logró un desarrollo significativo ($p < .05$) de la creatividad verbal y figurativa del grupo experimental en comparación con el grupo control. Los resultados del estudio muestran un mayor desarrollo de la creatividad verbal que la creatividad figurativa.

Conclusión. Con esta experiencia se demuestra la posibilidad de desarrollar la creatividad en la ESO. Las conclusiones del estudio se centran en resaltar la importancia de integrar el desarrollo de habilidades creativas a través de los objetivos y el proceso de enseñanza-aprendizaje implicado en la metodología educativa del currículum y resaltar la importancia del entrenamiento del profesorado en el desarrollo de las habilidades de pensamiento creativo.

Palabras Clave: Creatividad; Pensamiento creativo, Procesos de enseñanza-aprendizaje, Metodología educativa; Programa de intervención; Educación Secundaria Obligatoria.

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Introduction

The development of thinking skills is essential to attaining a higher level of learning and education, and helps the advancement of society. It is also necessary to incorporate their development in the aims and the teaching-learning process of the educational system.

The study of creativity in psychology began with Guilford (1950). Additionally, many other authors have highlighted its importance as a necessary mental skill for the present and future of society (Gardner, 1993, 2006; Sternberg & Lubart, 1995; Torre, 2006; Sampascual, 2007). Undoubtedly, there are benefits in developing creativity at any age and in any stage of education.

Creativity in general has been defined as the skill of generating new ideas or creating original and valued products. Traditionally, formal education has promoted conventional, critical, rational and sequential thinking. It is thus based on reproductive knowledge, and leaves development of creative thinking skills in second place (De Bono, 1970; Nickerson, Perkins & Smith, 1985; Mayer, 1992; Torre, 2006; Runco, 2007; Sampascual, 2007; Bernabeu & Goldstein, 2009). However, studies and research in instructional psychology have demonstrated that creative thinking skills are essential to reaching higher levels of education and successful learning (Sternberg, 1985; Lipman, 1991). Both research studies and educational practice have revealed the importance of developing creative thinking skills. Improved academic performance and a higher level of learning are also associated with creativity. Despite all these findings, the educational system still is lacking in sufficient development of such skills.

Various experiences have demonstrated the importance of developing creativity across different educational stages. Examples are found in international, European and national initiatives including projects, programs, studies and research interventions. Most of these have shown positive development of creative skills after the experimentation. Examples of international initiatives and research include the highly recognized Productive Thinking Program (Covington, Crutchfield & Davis, 1966), the CorRT Thinking Program (De Bono, 1973, 1985), the De Sánchez (1996) program and the Perkins (1993) studies. In addition, the

Zero Project (Harvard University, 2010) initially designed by Goodman at the end of the 1960s, considered development of creative thinking skills to be a main objective, and this project has many programs that have been applied in many countries and across different continents.

There are different studies that promote development of creative thinking skills from a European perspective, such as the Creative Learning Method (European Union, 2005), the Creativity Higher Education Project (European University Association, 2007) and the Creative Learning Communities Project (Education, Audiovisual & Culture Executive Agency, 2008; European Union, 2010). All of them emerged as a result of the European Year of Creativity and Innovation, 2009, proposed by the European Union (2008). Such studies have been applied at different educational levels and stages. Today, these initiatives remain in place due to the inclusion of creativity in key competencies for Lifelong Learning (European Union, 2006).

Finally, national initiatives are represented by the studies carried out by López (2001), who designed and assessed a program to develop creative thinking skills in students of Early Childhood and Primary Education. Also, research from Prieto, López, Bermejo, Renzulli and Castejón (2002) is based on implementation and assessment of the Renzulli and collaborators intervention program to enhance development of creative skills in Early Childhood Education and the first stage of Primary School. Moreover, Navarro (2008) has applied the same Renzulli intervention program in a Primary School. Finally, Garaigordobil and Berrueco (2011) designed an intervention program that was applied to improve creative thinking skills through play, in students of Early Childhood Education. Such programs have obtained positive effects in development of creative skills after their implementation.

Creativity development is important in all educational stages, though especially in Secondary Education, an educational period where students' cognitive, personal and social development is essential. In this period, students are starting to build their own future, and they use a more advanced type of thinking and rationality. Creativity, therefore, will have a positive effect in attaining these developmental aspects, since adult thought takes on more of a postformal thinking style (Arlin, 1975). This has been described as a fifth stage of cognitive development, characterized by being predominantly creative. Such aspects ensure higher and better cognitive development, and a greater capacity for choosing when making future

decisions, as a result of personal interest and broader criteria. Furthermore, it has been demonstrated that educational programs in this period do not sufficiently address development of creative thinking skills through the teaching and learning process, possibly leading to demotivation and consequently, school failure (Woolfolk, 2010).

Objectives and hypotheses

In light of the above, the study presented here consists of the design, implementation and evaluation of a program for creative skills development in a group of students in lower secondary education, level 2 (UNESCO, 2011). This program was based on Guilford's Structure Of Intellect (SOI) (1967a, 1967b) and pursues development of divergent thinking processes that he proposes (fluency, flexibility, originality and elaboration). Apart from these divergent thinking processes, the program sought to develop other thinking processes that promote creativity, such as critical thinking skills and metacognitive thinking skills, applied through the problem solving process (Allueva, 2007; Larraz, 2011). Moreover, it can be concluded from different authors (Nickerson, Perkins and Smith, 1985; Sternberg, 1985; Lipman, 1991) that higher-order thinking skills involved in problem solving processes are more directly related to a higher level of learning and education. Additionally, such higher-order skills are actually composed of critical thinking, creative thinking and metacognitive thinking.

The program was designed and implemented with the aim of developing creative thinking skills in a group of students. It has been evaluated in order to test its effects and to propose a suitable methodology for that purpose. The program addresses the issue of insufficient development of creative skills through teaching and learning processes at this stage, and it consists of a number of structured sessions that follow the program methodology, administered by teachers that were previously training in its use. The aim was to promote and stimulate students' creativity through the acquisition and application of creative strategies and through the use and application of divergent thinking processes applied in problem solving. To reach this aim, it is essential to first create a favorable environment, removing barriers to creative thinking (Osborn, 1953; Simberg, 1971, Lorna, 1998; Recio, 2005) that may originate from within or from the context (school, family, society).

Creativity can be encouraged globally by stimulating a creative thinking style, applying divergent thinking processes involved in problem solving and using different strategies to generate creative products.

Method

Participants

The sample that received the intervention was made up of Spanish secondary students. The program was adapted to the psychological, educational and social characteristics of the population for which it was intended, taking into account the individual differences among participants, who were treated in accordance with international ethical principles in scientific research.

There were two groups of students from lower secondary education, level 2 (UNESCO, 2011), from a school in Zaragoza (Spain). The sample was selected through opportunity, or convenience, sampling (Coolican, 2009). This selection is used in the case of an educational innovation opportunity, where research is performed using the existing natural groups from each class, assigning the groups to treatment or control conditions at random.

The study sample size was $N = 48$, with participants of both genders (48% females and 52% males). Half the participants ($n = 24$) were assigned to the experimental group (later reduced to $n=21$ due to the experimental mortality, based on attendance at 90% of the program sessions) and the other half ($n = 24$) formed the control group. Thus, the groups were equivalent in terms of number of participants under each condition (47% in the treatment/experimental group and 53% in the non-treatment/control group). The average age of the experimental group was 13.2 years with a standard deviation of 0.58; the average age of the control group was 13.17 years with a standard deviation of 0.38.

Instruments

The Torrance Test of Creative Thinking (TTCT) (Torrance, 1966) and the Test of Creative Imagination for Young Children (PIC-J) (Artola, Barraca, Martín, Monsteiro, Ancillo & Poveda, 2008) were used as instruments to assess creative thinking skills.

The TTCT Form A was applied as a pretest and the TTCT Form B was applied as a posttest. The TTCT is used to assess Guilford's divergent thinking processes (fluency, flexibility, originality and elaboration) in children and preschoolers. Fluency measures the number of ideas expressed; flexibility assesses the variety of ideas expressed, in terms of the number of existing categories; originality assesses novelty of the ideas, in terms of their rarity; and elaboration assesses details that improve the quality of the ideas. The TTCT has two subtests that assess two basic types of creativity: verbal creativity and figural creativity. The test was chosen for its international relevance in assessing creativity, continuing to be used widely because of its proven reliability and validity in various studies (Ferrando, Ferrándiz, Bermejo, Sánchez, Parra & Prieto, 2007; Runco, 2010).

The PIC-J was used as a follow-up test to assess the program effects. This test consists of four subtests, three evaluate narrative creativity (verbal creativity in the TTCT) and one evaluates graphic creativity (figural creativity in the TCTT). Characteristics of the PIC-J are similar to those of the TTCT. This standardized instrument has been validated with a Spanish population and assesses fluidity, flexibility, originality and elaboration. It also evaluates two further components of figural creativity: the "title", which is defined as a subject's ability to make a fitting sentence for a picture, more or less original and not merely descriptive (Artola, et al., 2008); and "special details", defined as a subject's ability to map details such as unions, inversions or expansions to the different drawings (Artola, et al., 2008). This test was chosen because it has been tested and evaluated by the authors in a Spanish sample and is appropriate for assessing creativity, presenting evidence of high reliability and validity.

Procedure

The research procedure consisted of designing, implementing and assessing a creative skills development program in a group of students at level 2 of lower secondary education (UNESCO, 2011), ages 13-15. A quasi-experimental, repeated measures design with a non-equivalent control group was used. The study also included a third additional assessment, consisting of a follow-up test in order to assess the degree of stability and permanence of program effects three months after administration of the posttest (see Table 1).

Table 1. Intervention design

Group	Assignment	DATA COLLECTION SEQUENCE			
		Pretest	Program	Posttest	Follow-up test
Experimental	NR	O ₁	X	O ₂	O ₃
Control	NR	O ₁	-----	O ₂	O ₃

Note. NR: Participants' assignment to groups not known and Not at Random.

The creative skills development program was designed by creating a series of stimulating and motivating activities tailored to the participants' developmental level. The school's teachers and Guidance Department provided input to this process. The seven exercises of the program were conducted over nine sessions, and aimed to develop creative thinking skills and other thinking processes in open and closed problems, applied to both a specific domain (Technology subject) and a non-specific domain (Homeroom). The program was implemented during the 2008/09 academic year, including an initial contact with the school, instruction in the program methodology for teachers who collaborated in the implementation, program application and final evaluation. The program lasted for seven months from the pretest to the follow-up test. Prior program instruction for participating teachers followed the conceptual and methodological program criteria. The intervention was carried out in coordination with the teaching staff at the school and the Educational Guidance Department, within the school's Homeroom Program.

The program structure follows:

- Creativity pretest evaluation. Form A of *Torrance Test of Creative Thinking* (Torrance, 1966). Data collection from an initial assessment of creativity with the experimental and control groups.
- Program sessions with the experimental (intervention) group.
- Creativity posttest evaluation. Form B of *Torrance Test of Creative Thinking* (Torrance, 1966). Data collection from a final assessment of creativity with the experimental and control groups.
- Creativity follow-up assessment. *Imagination Creativity Test (PIC-J)* (Artola et al., 1966). Data collection from a follow-up assessment of creativity with the experimental and control groups.

In order to development creativity during the program sessions, the following criteria were kept in mind: a) To discover, eliminate and overcome barriers to creative thinking; b) To promote a positive attitude and willingness to explore and express creative potential, applying creative thinking processes and making use of creativity in the classroom; c) To promote a creative thinking style; d) To produce creative products through applying the creative process involved in problem solving; e) To encourage the use of the Guilford's divergent thinking processes (1976) (fluency, flexibility, originality and elaboration) through the different tasks, persons and strategies used; f) To consider and encourage social factors that foster creativity (creative self-efficacy, intrinsic motivation, internal evaluation of the task and reinforcement of creative situations); g) To consider the individual characteristics of each student; h) To encourage use, learning and transfer of learning strategies in order to develop creative skills.

Program sessions were structured around the objectives, content, methodology, activities and evaluation criteria within the Technology subject and the Homeroom Program. Activities were based on generating ideas and solving problems where creative strategies and techniques were applied to develop verbal and figural creative skills. The activities included:

- An informative talk about the program, its activities, and the important factors of creativity.
- A short description about the Guilford (1976) divergent thinking processes. An activity was conducted in order to understand and develop figural creativity through completing drawings, using the brainstorming strategy (Osborn, 1953).
- Assess and understand barriers to creative thinking. An adaptation of Lorna (1998) *Inventory of Barriers to Creative Thinking and Innovative Action* was applied and corrected.
- Indicating possibilities for recycled objects, using the brainstorming strategy (Osborn, 1953).
- A product design activity, using the Checklist strategy (Osborn, 1953).
- A storywriting activity using narration of imaginary events, with metaphors, analogies, relationships, inventions, fables, etc. (Rodari, 2004).
- Activities to understand and apply the Amabile (Componential Model of Creativity) (1983) creative problem-solving model and other problem-solving models.

Each session was structured using evaluation and correction criteria in order to keep a daily log of the evolution and development of creativity. Narratives from the daily logs of each session were later analyzed after program implementation, in order to compare results from the exercises with the tests taken, and to observe the progress of the intervention program itself.

Statistical Analysis

Statistical analysis was applied to the development of creative skills results before and after the intervention program. Ideographic and nomothetic approaches were used to observe agreement between the two levels. For the nomothetic study of program effects, an ANOVA between the initial and final tests was performed, using inter-group and intra-group change scores, and for the follow-up tests, an ordinary inter-group ANOVA was carried out. For the ideographic study of the program effects, between initial and final testing, we analyzed the proportion of creative skills developed in the participants.

Results

The results obtained from an analysis of intra-group and inter-group differences for each creativity variable are shown in Table 2 as a nomothetic approach. The first column shows the mean change in score within the same group (intragroup differences) and the standard deviation, while the second column shows the significance of this difference. The next three columns represent the mean difference of change in score between the two study groups (intergroup differences), the standard deviation, and the probability of Type I error (α) and its significance. The statistical confidence level was set at 95%.

Table 2. Intragroup and intergroup differences in creativity due to the intervention program. Mean, Standard Deviation and ANOVA results.

Verbal Creativity	Group	Intra-group Difference		<i>p</i>	Inter-group Difference		<i>p</i>
		M	SD		M	SD	
Fluidity	E	17.6	7.6	<.05	42.3	10.4	.001***
	C	-24.7	7.1	<.01			
Flexibility	E	9.4	2.3	<.01	11.3	3.2	.002**
	C	-1.8	2.2	>.05			
Originality	E	32.9	10.3	<.05	50.6	14.1	.001**
	C	-17.7	9.6	>.05			
Total Verbal Creativity	E	59.9	19.3	<.05	104.2	26.5	.0001***
	C	-44.2	18.1	<.05			

Figural Creativity	Group	Intra-group Difference		p	Inter-group Difference		p
		M	SD		M	SD	
Fluidity	E	8.	1.9	<0.5	1.1	2.5	.655
	C	6.	1.7	<0.5			
Flexibility	E	1.	1.0	>.05	2.1	1.4	.160
	C	-	0.9	>0.5			
Originality	E	14	3.3	<.05	5.3	4.9	.094
	C	9.	3.4	<.5			
Elaboration	E	19	3.8	<.05	26.9	5.2	.0001***
	C	-	3.5	<.05			
Total Figural Creativity	E	44	8.1	<.05	36.0	11.2	.001**
	C	8.	7.6				

Note. E: Experimental; C: Control; *** $p < .001$. ** $p < .01$. * $p < .05$.

According to the nomothetic results obtained, the following intragroup and intergroup differences were seen as a result of the intervention program (Table 2):

- At the intragroup level, verbal and figural creativity skill development was significant in the experimental group in all the creativity variables ($p < .05$) except figural flexibility ($p > .05$).
- At the intergroup level, creativity skill development was significantly higher in the experimental group than in the control group in all the verbal creativity variables (fluidity: $p < .01$; flexibility: $p < .01$; originality: $p < .01$ y; verbal creativity: $p < .001$). In addition, there was a significant difference between both groups in figural creativity ($p < 0.01$) and in the elaboration variable ($p < .001$). The experimental group was higher than the control group in development of figural fluidity, flexibility and originality, but these differences were not statistically significant ($p > .05$).

In the follow-up test, scores from the TCTT and the PI-J could not be compared within groups because of the different measurement scale. Therefore, only the intergroup differences observed at one time in the assessment were analyzed (Table 3).

Table 3. Intragroup differences in creative skill development on the Follow-up test (PIC-J).

Variable	Group	Mean	SD	p
Narrative Creativity	E	62.5	7.0	.009**
	C	36.3	6.5	
Fluidity	E	54.1	7.1	.072
	C	36.6	6.6	
Flexibility	E	61.4	6.4	.0001***
	C	25.9	6.0	

Originality	E	63.8	7.0	.005**
	C	35.2	6.6	
Graphic Creativity	E	84.0	4.9	.001***
	C	60.0	4.6	
Originality	E	69.6	5.4	.042*
	C	55.0	5.0	
Elaboration	E	76.4	6.4	.002**
	C	46.9	6.0	
Special Details	E	94.4	4.7	.0001***
	C	76.0	4.4	
Title	E	41.2	5.8	.128
	C	31.5	5.4	
General Creativity	E	65.4	7.0	.005**
	C	37.3	6.6	

Note. E: Experimental; C: Control; SD: Standard Deviation; *** $p < .001$. ** $p < .01$. * $p < .05$.

Nomothetic results on narrative and graphic creativity at the follow-up test showed significant differences between the experimental group and the control group for most of the creativity variables (Table 3). Specifically, creativity development in the experimental group was significantly higher than the control group for narrative flexibility, special details and graphic creativity ($p < .001$); for elaboration, narrative creativity and general creativity ($p < .01$); and for graphic originality ($p < .05$). The development of narrative fluidity and title were greater in the experimental group than in the control group; however, the differences were not significant ($p > .05$).

As outlined above, there was a significant difference between the two groups in development of creativity, with such differences remaining three months after program administration. This was true all study variables except narrative fluidity, where differences between the two groups were not significant or even favored the control group, as we observed in graphic originality.

As for the idiographic analysis, results were consistent with those from the nomothetic analysis. Table 4 presents the proportion of participants from both groups who showed significant creativity development, as well as differences observed between one group and the other. Accordingly, the experimental group attained significant development in figural creativity, at 90%, and in verbal creativity, at 62%. In addition, a high percentage of the experimental group participants had significant development in the verbal creativity variables (fluidity: 57%; flexibility: 81%; originality: 57%) and in the figural creativity variables (fluidity: 76%; flexibility: 52%; originality: 86%; elaboration: 76%). Finally, the difference

between the two groups in their development of verbal and figural creativity was 37% and 36%, respectively, in favor of the experimental group.

Table 4. Proportion of significant creativity development between the initial and final tests, for each of the two study groups, and difference between the groups.

Variable		Experimental Group (EG)	Control Group (CG)	Difference EG-CG
Verbal	Fluidity	57%	21%	36%
	Flexibility	81%	33%	48%
Creativity	Originality	57%	29%	28%
	Verbal Creativity	62%	25%	37%
Figural	Fluidity	76%	71%	5%
	Flexibility	52%	33%	19%
	Originality	86%	71%	15%
Creativity	Elaboration	76%	21%	55%
	Creativity	90%	54%	36%

Conclusions

Results show the importance of developing creativity in Secondary Education and in the curriculum, through class subjects, through objectives and through the teaching-learning processes employed by teachers in the classroom. Thus, participants in the experimental group showed significant creativity development in both intergroup and intergroup analysis. The intervention was positive and the program achieved its intended effects, namely, development of creativity in a group of students of lower Secondary Education, level 2.

Results from this study are consistent with those observed in previous studies, by various authors, within the realm of creativity development. The national initiatives (Allueva, 2002; Garaigordobil & Berrueco, 2011; López, 2001; Navarro, 2008; Prieto et al., 2002), the European studies and projects (European Union, 2006), and the International projects (Crutchfield & Davis, 1966, De Bono, 1973, 1985; De Sánchez, 1996; Harvard University, 2010) have shown significant creativity development at different stages and different educational levels.

Furthermore, program effects in verbal and figural creativity development, as seen in the results, were maintained for both variables ($p < .05$) three months after the program. Upon program completion, significant development in verbal creativity and its variables was observed, in addition to significant development in graphic creativity and elaboration. Three months after the intervention, significant development of creativity was observed in the same variables except in verbal fluidity, whose development was no longer significant ($p > .05$), and in graphic originality ($p < .05$), whose development passed to the significant side. The stability of these results demonstrates consistency in the nomothetic and idiographic analyses, and high reliability of the intervention program.

Notwithstanding, this study has some limitations, for example, development of figural creativity was not as great as had been desired. This factor may be due to a shortage of figural creativity within the program. It may demonstrate that the factor developed equally in both groups, or that its incidence was not very high in the experimental group. Therefore, in subsequent interventions it would be appropriate to increase the number of activities related to figural creativity.

To improve this study, another possible suggestion involves its design. First, the results should be interpreted with caution since only a small sample of students was represented, future interventions should involve larger numbers of participants. Furthermore, from an evaluation perspective of the creative construct, it was shown that divergent thinking processes describe the essence of creativity, even though creativity cannot be reduced to these processes (Santaella, 2006; Sternberg & Kaufman, 2010). This study evaluates essentially the processes without delving into other factors, such as the influence of context (social, educational, environmental and family), personality factors (initiative, sensitivity, self-esteem, independence, etc.) or creative product (innovation in the result, objects and products). These factors should be considered in further research.

Despite these limitations, this study has shown that creative skills can be effectively enhanced and developed through relevant activities and efforts using an appropriate methodology.

In addition, the social context of the intervention should be considered. In many cases, the creativity development curriculum is not valued because of strict monitoring of

educational programs and limited flexibility for applying an innovative methodology to develop creativity (Santaella, 2006). To develop creativity in the educational context, teachers should be trained in these skills, and strategies and methods should be promoted, so that students can learn new skills that are especially suited to the social context and emerging needs of the 21st century.

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