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The Google Sketch Up Software As A Tool To Promote Creativity In Education In Greece

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Abstract

The three-dimensional design software called “SketchUp” was first presented by Google in 2006 and was created to facilitate the design of buildings for the three-dimensional city display on Google’s satellite maps. It is a modeling tool which can be used to create anything, from simple 3D shapes to complex models, thereby promoting creativity (Dewey & Down; Fischer et al., 2005; Kintsch; Kafantaris, 2010; Sarimpalidis, 2010; 3dvinci, Teacher’s guide, NCTM Meeting SketchUp Talk). Creativity is still a point of concern today, both as an object of psychological research, as well as a goal of the educational process. The ability to be creative attracted the interest of researchers in the empirical psychology of the 20th century. Creativity is the ability to express one’s thoughts in an essentially new, original way that surpasses the ordinary. It is a fantasy or a compilation of thoughts that are not simply quoted or stitched together. Creativity may include the development of new systems, the transfer of familiar relationships to new situations, or the formation of new associations (De Bono, 1976; Florida, 2003; Stain, 1975; Tharp, 2003; Xanthacou & Kaila, 2011).

In this study, we attempt to investigate the effect of the students’ involvement with Google Sketchup on the three dimensions of creative expression: fluency, flexibility, originality.

The study participants were 45 students in the first grade of the EPA.L. (Vocational high school) of Zakynthos. For this study, the students were divided into two groups. The first group (experimental group) created designs on the computer using the Google Sketchup software, while the second group (control group) created designs using design tools. In the end, the two groups of students completed a common test of divergent creative expression.

The results’ analysis indicated the positive effect of software use on the students’ creative expression, regarding fluency and flexibility of thought. The capacity for originality of ideas was not significantly affected. The fact that two of the three elements of creative expression presented a statistically significant difference in the experimental group proves that the Google SketchUp software has the ability to affect the creative expression of students.

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1.1 Definition of the concept

One of the first definitions given for creativity is attributed to Guilford (1950): «Creativity covers the most typical abilities of the creative individuals, determining the probability for an individual to express his creative behavior, manifested by ingenuity, composition and design.» Already in Guilford, despite the simplistic definition of tautology of his definition, some emerging evidence that enriched and subsequently confirmed by investigators can be seen.

Creativity is:

- a certain way of behavior towards the problems
- This behavior seems to be associated with certain personality traits
- these features speculate if and how the behavior will occur
- creativity refers to all people and not just the rare talents (Csikszentmihalyi 1999, Florida 2002)
- the variation between individuals is quantitative, rating matter, rather than qualitative.

Maslow, an American psychologist (1963), supports the catholicity and universality of the concept: "Creativity is a universal characteristic of the person that is self-realized" not only as an expression to all people but in many activities as a way of life, most of the everyday, simple and practical ones under the seal of self-realization through this unique performance, original and statistically rare.

Analyzing the process of creativity, there is a decisive force deriving from the usefulness and the appropriateness in terms of change, renewal and updating. The above criteria are visible in the definition of MacKinnon (1961), according to which "creativity is a process that takes place over time and is characterized by originality, adaptability and the spirit of caring for a particular realization."

E. Paul Torrance (1966) was an international leader in creativity research and he defined creativity as a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, ad so on; identifying the difficulty; searching the solutions, making guesses, or formulating hypotheses about the deficiencies: testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results.

Describing in detail the standards on the nature of human intelligence, Guilford (1960, 1962) refers to the memory, cognition, evaluation, convergent thinking, creative or divergent thinking as the five types of mental processes, taking into consideration, though the different and separate process between divergent and convergent thinking.

1.2. The criteria of creative thinking

A. Sensitivity to environmental problems. This ability is the spark of the creative process to the extent that the person can discern a problem, be aware of a difficulty, record the unusual, seek an interpretation for the peculiar, when no other person will not indicate anything.

B. Mental discretion. In creative thinking there is the ability to produce large numbers of ideas, answers and solutions to some stimulus or problem within a predetermined time. The control of mental power is achieved by counting the total number of responses of the individual.

C. Mental agility / flexibility. The creative person does not resort to conduct routine, he has the ability to be distracted by the mental habits, to jump from one mode of thinking or approach to each other and produce a variety of responses.

D. Originality of thought. It is the most important features of divergent thinking, with productions that meet the criteria of rarity and uniqueness. The prototype is defined in connection with the unusual.

E. Synthesis. To a large extent, the creative thinking requires the organization of ideas into broader patterns, more succinctly, as Guilford argues, assuming that most ideas can be combined to synthesize a new improved production quality.

F. Ability transformations. Organized groups are already reorganized. Many inventions resulting from the transformation of one object to another, whose form, function or use changes.

G. Ability to edit. The creative person is able to make a viable idea, develop it in detail, to improve it, to complete or even make it attractive (Xanthacou 1998:40-42)

1.3. The stages of the creative process

Wallas (1926) was among the first who attempted to record the stages of the creative process, which then were attached to the well-known creative problem-solving strategy (Parnes 1991:54-56, Xanthacou & Kaila 2011:63-79). According to him the steps are:

A. The stage of preparation. At this stage the definition of the problem and the work design is attempted, while concentrated necessary data for resolution are assembled.

B. The stage of incubation. This is characterized by the absence of overt activity, a mechanism that facilitates the individual to make new combinations and correlations of the information received from the environment.

C. The stage of inspiration. At this stage the solution to the conscience of man emerges, which is accompanied by intense feelings of satisfaction and relief.

D. The stage of assessment, reporting, control of affairs. It is the stage that follows, during which, the validity of the find, according to its usefulness, appropriateness, legality, efficiency, and even the cost of its implementation.

1.4. Creativity and Education

Creativity is activated when the appropriate stimuli are there. It is particularly evident in the game and other activities for children. The path of creativity in human life has been growing from infancy, and during the child's entry to school it is reduced as a consequence of adaptation to the school program and the corresponding obligations. The activation of imagination and research mood during training are key factors for enhancing creativity of the individual (Clements et al. 1992).

The challenge of the future, which is the creative citizen, seems to be shaped by elements of self-realization, freedom and security, and such thing can only be created by an education with care, planning, daring and imagination. Creative education is made possible under a new system of ideas that raises an incentive system for inventions and innovations with the systematization of lifelong education and the acquisition of basic training at any age. The "ideal practice learning" in Rentzulli (1992) requires dynamic and concerted interaction of three key actors in the learning process: the student, the teacher and the curriculum.

The curriculum should aim at creating a new profile citizen who will be able to live and thrive within a framework proposed by the inter shapes such as: culture, environment, development, equality, interaction, cooperation. The creative curriculum attempts to completely shift the educational goals of the worldview of traditional education in a global creative problem setting up the educational scene (de Bono 1991:171-179).

The teacher, that seeks to harness the creative talents of students, should be well aware of what actions promote or inhibit creative behavior. We have those skills that will contribute to the cultivation of psychosocial and spiritual potential of the developing individual's recent and long-term demands of the students' life (Beghetto, 2006, de Bono 1991:180-183).

A school that aims to foster the creative capacity of students must turn the formative creative personalities to expose the student to different types of learning, different procedures, to train him to be responsible for their own learning and the learn to experiment, avoiding adopting unambiguous ways of thinking and behavior (Glaxton 2003). Torrance (1972) formulated the following principles of development of creative thinking of students:

- Respect for unusual questions
- Respect for the unusual ideas that show imagination
- Recognition of the value of ideas
- Assignments for practice, no rating
- Taking into account the causes and consequences when grading

Nowadays, the efforts for the implementation of creativity in education are increasing. In this context, new teaching materials and modern teaching methods using new technologies are created. (European e-Skills Forum 2004). However it is necessary to also train teachers and to introduce creative thinking in education. The primary objectives of teacher education are (Devins et al., 2002):

- to provide knowledge for the assessment, treatment and cultivation of creative thinking
- to practice in teaching methodologies that foster the creative idea generation
- to cultivate creative thinking of the teachers.

Some techniques that can be applied to achieve creativity in education is the technique of brainstorming (brainstorming) (Stein, 1975), the creative problem solving (Stein, 1975), the consistent method (Stein, 1975), the list of creative questions, the morphological analysis, the list of properties and mapping of an idea, the six thinking hats of de Bono and the technique of “Learning through pleasure”.

1.5. Google SketchUp Software

The activities included in the “Google SketchUp” section are mainly based on a three-dimensional design program called “SketchUp”, which was first presented by Google in 2006 and was created to facilitate the design of buildings for the three-dimensional city display on Google’s satellite maps (Kafantaris, 2010). It is a modeling tool for creating, presenting and communicating ideas through three-dimensional representation. It consists of a three-dimensional graphic display, which can be used to create anything, from simple 3D shapes to complex models, thereby promoting creativity (Fischer et al., 2005). One of the real advantages of the software is that it uses a collection of tools, which makes it suitable even for young ages, since it does not set any limits to what children can achieve. Another advantage is that its operation is not based on the use of language, which makes it ideal even for children with special educational needs (Dewey & Down; Fleron, 2009; Kintsch; Lintunen, 2010; Sarimbalidis, 2010; 3dvinci, Teacher’s guide; Trento and Jeong 2008; NCTM Meeting SketchUp Talk).

A research team at Google is working on the objective of having a whole world modeled in 3D and letting people use Google Earth to explore this virtual 3D world. This desirable objective cannot be achieved solely by a development team at Google due to the sheer amount of work it requires. The team at Google has chosen to create a socio-technical environment by integrating SketchUp, 3D Warehouse and Google Earth to support everyone motivated enough to participate in this effort. This project represents a unique, large-scale example in evaluating the conceptual framework for social creativity and cultures of participation. SketchUp is a high functionality environment with a low threshold and a high ceiling, developing sophisticated models with SketchUp requires a nontrivial learning effort. In order to motivate enough people, powerful learning mechanisms for SketchUp are critical to allow everyone who wants to contribute to learn how to do so.

The 3D Warehouse is an information repository for the collections of models created by any users who are willing to share the models they created through SketchUp. The 3D Warehouse contains hundred thousands of models from different domains, including buildings, houses, bridges, sculptures, cars, people, and pets. It supports collection mechanisms to organize models and support ratings and reviews from community members. Google Earth has the capability to show 3D objects consisting of users’ submissions that were developed using SketchUp (Fischer, 2011).

2. Methodology

In this study, which is conducted as part of a doctoral thesis, we attempt to investigate the effect of the students' involvement with Google Sketchup on the three dimensions of creative expression: fluency, flexibility, originality. It has already been developed through an online educational tool on www.zantemonastery.com, in the sustainable management of the monastery of St. George Island of the Flap in Zakynthos in the Ionian Sea in Greece. This monastery is the research topic of students' research.

The study participants were 45 students in the first grade of the EPA.L. (Vocational high school) of Zakynthos. For this study, the students were divided into two groups. The first group (experimental group) created designs on the computer using the Google Sketchup software, while the second group (control group) created designs using design tools, but both of them designed based on the monastery’s architectural structures. In the end, the two groups of students completed a common test of divergent creative expression. To collect the data, a research tool was used, whose structure was built mainly for reasons of validity and reliability according to Torrance Tests of Creative Thinking (TTCT) (Torrance 1974). This measure is made up of three subtests, including fluency, flexibility and originality. The score of fluency represents the subject’s ability to generate ideas with words. Flexibility refers to the subject’s ability to produce a variety of kinds of ideas. Finally,

originality reflects the subject's ability to generate ideas away from the obvious or common responses. The rates in each dimension were calculated with the scale of the 100 setting the maximum value calculated between subjects as the highest rate (100%). The average of three tests gave the final overall index of creative expression. The three tests had a normal form of research. There are three open questions. The first one asks the kinds of rock with which they chose to invest the walls of the monastery of St. George of the Flap, the second one asks to elicit questions about the peculiar architectural features of the monastery and the third asks from the subjects to make multiple, innovative ideas on sustainable management of the monastery.

More specifically, the questions raised were the following:

A) What kind of rock would you choose to invest the walls of the monastery of St. George of the Flap?

Typical student responses:

With falcon-stone

With Zakynthian bricks

With limestone (white) stone

With Albanian stone

With marble

B) Write all the questions you would like to ask about the peculiar architectural features of the monastery. Do not ask questions that can be answered simply by looking at the image of the monastery.

Typical student responses:

Why does the tower of the monastery have a round shape?

Why does it have such a small church and why is the monastery so big?

Why are there newer houses built?

Why are there murder-holes in the tower of this monastery? (Small windows where they poured hot water so the monks could encounter pirate attacks)

C) In what ways do you think that the sustainable management of the monastery can be ensured? Think of as many ideas as you can and write them.

Typical student responses:

With energy saving systems

With waste management systems

With wastewater management systems

With interior configuration

3. Results / Conclusions

Originally the equivalence was checked, based on selection criteria of the two groups. As shown in Tables 1 and 2, the experimental group and control group are equivalent, and there is nowhere found a significant statistical difference.

Table 1. Checking equivalence of the two groups

groups	Gender	Gender	Ethnicity	Ethnicity	Grade	Grade	Grade	grade
	Boys	Girls	Greek	Alien	11-12	13-14	15-16	17-20
Experimental group (N = 23)	11	12	21	2	2	3	4	14
Control group (N = 22)	11	12	21	2	2	3	4	14

Table 2. Average performance in T.T.C.T. by group

Groups	Fluency	Flexibility	Originality	General index
Average	Average	Average	Average	Average
Experimental group (N = 23)	81.5	72.6	75.7	76.6
Control group (N = 22)	32.5	45.7	60.4	46.2

As for the creative thinking of students in both groups, the analysis of variance (ANOVA) between performance in the TTCT test category (power, flexibility, originality and overall index) it showed that there are significant statistical differences. Specifically, (Table 2), in discretion, the average of the experimental group is 76.6 and the average of the control group 46.2

On the scale of power, a statistically significant difference in performance between the two groups was noticed, the superiority of the experimental group students to produce original ideas can be observed. As far as flexibility is concerned, the statistical difference in performance between the two groups is significant and shows that students in the experimental group produced ideas from much more thought categories. As far as originality is concerned, a statistically significant difference in performance between the two groups was not observed.

Our hypothesis as to the power and flexibility is therefore verified, ie the positive effect of using Google Sketchup software for the creative expression of students in the production of ideas in open-ended questions from several thought categories in relation to the control group students used by traditional imaging and design.

Based on the conclusions, the use of Google Sketchup Software should be included enhanced in the educational process. In relation to teachers, their theoretical and practical training would be useful even in the form of seminars.

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