

# Creativity—Innovative Thinking—Tolerance in Uncertainty: Views of Undergraduate Students in Greek Universities Based on the Faculty of Their Studies

Yota Xanthacou<sup>1</sup>, Nektarios A. Stavrou<sup>2</sup>, Thomas Babalis<sup>2</sup>

<sup>1</sup>University of the Aegean, Rhodes, Greece

<sup>2</sup>University of Athens, Athens, Greece

Email: [xanthakou@rhodes.aegean.gr](mailto:xanthakou@rhodes.aegean.gr), [nstavrou@phed.uoa.gr](mailto:nstavrou@phed.uoa.gr), [tbalalis@primedu.uoa.gr](mailto:tbalalis@primedu.uoa.gr)

Received September 30<sup>th</sup>, 2012; revised October 30<sup>th</sup>, 2012; accepted November 16<sup>th</sup>, 2012

Innovative-creative thinking and tolerance towards uncertain situations concern the field of the present study. Through scenarios and alternative proposals that concern views about the presence (university) or the future as well (professional career after the university), the research focuses on undergraduate students in Greek universities. The research took place in 2011 in a sample of 836 students, using the questionnaire as an instrument, in a difficult financially and socially conjuncture for the country, with the unemployment galloping especially in young people and graduates. The present study examines the extent to which the type of student's studies (social science and science) differentiates innovative-creative thinking and tolerance towards the uncertainty of subjects. Results showed that undergraduates of Social Science Faculties make more "conservative" choices, both during their studies as well as during the selection of professional perspectives. On the other hand, students of Sciences show higher tolerance in uncertainty, pursuing more challenging working conditions, as well as assessment conditions during their studies, in comparison to students of Social Science Faculties.

*Keywords:* Creativity; Innovative Thinking

## Introduction

In an era in which the crisis, the ineffective policies, the isolationism in European Union create a reasonable skepticism about countries that are full of problems, mainly economical, especially in South European, and particularly in Greece, in our country, the map of poverty deepens. Newly-poor people and newly -homeless are increasing, households are drying, companies are putting a padlock, while the living standard is being reduced by 20%. In the foresight of increasing unemployment, at least 50% are young people, while two out of five homeless includes persons under 45 years old that are graduates of universities.

Today, where the unpredictability prevails and where the solutions to problems are not always assisted by past experiences only, in which ways innovative-creative thinking is encouraged, how designs and strategies are cultivated in universities in order to find solutions to problems that will serve man and not only profit and especially the short-term one? How tolerance to ambiguity is encouraged in Universities and how people are assisted to insist on goals and projects with perseverance and without abandoning the effort, ideas, paths, when encountering obstacles and resistances?

Innovation, as a successful completion of new ideas (Grossman & King, 1990; Xanthacou & Kaila, 2011; von Stamm, 2008), through improvements (innovation by improvement), with extension and enrichment of products with new benefits (innovation by extensions) and as a production with the adoption of a paradigm (innovation through paradigms), constitutes a process of creative-divergent thinking. The person who pos-

esses and cultivates creative thinking experiments, takes risks, manages the complex and incomplete, asks questions, is open to new experience, offers flexibility in thinking and independent opinion, beyond the conventions, and is insistent on the chosen objectives (Puccio, Murdock, & Mance, 2007; Xanthacou & Kaila, 2011).

Innovation through creativity is a very important factor and competitive advantage for modern societies, organizations, universities, the economy under the dynamic environment characterized by change and globalization. Literature refers to many definitions and boundaries of creativity and innovation concepts. Widely accepted definition is that creativity is the production of new and useful ideas, while innovation is the successful implementation of these ideas in an organization, a business, an institution (Amabile, Conti, Coon, Lazenby, & Herron, 1996). According to surveys, European economies are low in commercially successful innovations, while Japan comes first at this level. Under this reasoning, the problem lies in the attempt to reform the universities, in order to invest in new knowledge and to promote the academic staff and researchers to undertake new initiatives and risk for new scientific paths. As China that emphasizes innovation, encouraging new people to be adventurous and develop innovative products in the industry (OECD, 2006; Phelps, 2007; Shahid, 2009). It seems that the percentage of creative people in a society increases, when three conditions are satisfied: 1) significant value is attributed to learning in a stable home environment from early childhood to qualification and training and after college; 2) value is attributed to the health and happiness, to the quality of life of people in society. Lewis Thomas observed that every

time he passed through a lab and was listening to laughter from the group, that was evidence that achievement-stunning results would emerge from the laboratory; 3) value is assigned on knowledge and its growth, so that students and researchers can specialize more and more to move certain objects thoroughly. Conversely, Di Tella and MacCulloch (2006) research found that unemployment and inflation reduce happiness of individuals, with unemployment having the highest percentage.

Beneath these facts, what is the basic innovative-creative thinking and tolerance towards uncertain situations of graduate students of Greek universities and how much do they vary depending on the faculty they are studying that is how the social sciences graduate diverse of those of sciences, are the basic research questions of the present study. In short, factors “creativity-innovative thinking” and “perseverance-tolerance of uncertainty” are the main pillars of the present study.

The purpose of the present study is to investigate the differences between graduate students of different studies on the creativity, the innovative thinking and the perseverance/tolerance towards uncertainty. Particularly, the research objectives of the study are the followings: 1) the faculty differentiates creativity and innovative thinking of students; 2) studies influence perseverance/tolerance towards the uncertainty of students.

## Methodology

### Participants

The participants of the research were eight hundred thirty six (836) graduating students of Higher Education Institutions. More specifically, two hundred forty (240, 28.7%) were boys and five hundred ninety six (596, 71.3%) were women. Regarding their studies, four hundred seventy two (472, 58.8%) students enrolled in departments of Social Sciences, while three hundred thirty one (331, 41.2%) students enrolled in departments of Sciences. Of all the students surveyed, seven hundred ninety nine (799, 95.6%) report that they speak foreign languages, and seven hundred and ten (710, 84.9%) students declare that they know how to handle a computer.

### Measuring Instruments—Questionnaire

The instrument, which was used in this study, is the questionnaire composed of two parts. The first part consists of students' demographic information and the second part contains questions, which were formed based on research purpose and objectives of the research. Especially, the following questions were used based on the research purpose of the study:

1) Characterization of the method as mentioned by Woody Allen when he said: “I took lessons on fast reading, learning to read directly in the middle of the page and I managed to read “War and Peace” in 20 minutes. It talks about Russia...” Specifically under the above so-called, students were asked to characterize this method of study as 1) fast and effective; 2) fast and ineffective; and 3) fast and creative (creativity).

2) Interpretation of the words of Louis Pasteur, which was asked “How did you manage to do all these discoveries? Did luck help you?” He replied: “Luck helps pre-prepared thought.” Students were given two alternative responses, which were the following: 1) The great discoveries are made accidentally and unexpectedly. Hence Archimedes shouted with surprise “Eureka!” and 2) Luck is an effort product.

3) The students' views on the key element of creative production and completion of an original artistic or scientific product between alternative responses: 1) a unique talent which has inherent charisma; and 2) culture and learning (creativity).

4) The desired workplace after completing their studies (private sector, public sector, personal business, family business) (persistence—tolerance for uncertainty).

5) Criteria for selecting students between two tasks, where the first option refers to a funded program for his/her own business venture and the second option in a steady job, which will have a salary and stamps (persistence—tolerance for uncertainty).

6) Students' criteria selection of a scientific job based on 1) the degree of challenge and 2) the certainty that they can handle the demands of work (persistence—tolerance for uncertainty).

### Procedure

Instrument completion was accomplished during the educational program of students in their department and in particular during the spring semester of the academic year 2010-2011. The researchers administered the questionnaire during the course in consultation with the head teacher. During the completion of the questionnaire, all the necessary clarifications have been given, contributing thus to a better understanding of the questions. It was also referred to the participants that their responses are anonymous, confidential and will be used only for research purposes. The duration of completion of the questionnaire was about fifteen (15) minutes.

### Statistical Analysis

Before conducting the main statistical analyses the degree of reliability of the questionnaire was tested. The results of applying reliability methods of the questionnaire factors (covariance and correlation of the questions, Cronbach  $\alpha$ ) met the criteria for acceptable reliability. Specifically, the internal consistency index (Cronbach  $\alpha$ ), for the questionnaire was .87, a value considered as fully satisfactory. The reliability of the questionnaire scales was also tested through test-retest reliability. The results supported the existence of acceptable values ranging from .73 to .91, providing further support to the reliability of the measuring instrument.

In the present study and according to the purpose and the research questions of this study descriptive statistics indicators were used, such as mean ( $M$ ), standard deviation ( $SD$ ), percentage frequency and cumulative percentage frequency. Also, cross-tabulation was used in order to examine the purpose and the research questions of the present study (Pearson  $\chi^2$ ,  $df$ ,  $p$ -value), as well as, Mann Whitney test.

## Results

### Basic Knowledge of Creativity—Innovative Thinking: Differences between Students of Sciences and Social Sciences Faculties

**Table 1** presents the cross-tabulation results between students of Social Sciences and Sciences Faculties and the method of studying as was presented from the words of Woody Allen. This particular actor once said: “I took lessons on the fast reading, learning to read directly in the middle of the page and I

managed to read “War and Peace” in 20 minutes. It talks about Russia...”

The results of the cross-tabulation analysis did not reveal the existence of statistically significant differences (Pearson Chi-square  $\chi^2 = .102$ ,  $df 2$ , ns) between students of different studies. In particular, based on participants’ answers it seems that they evaluate and characterize the specific method as fast and ineffective and in a smaller percentage as fast and effective or creative.

In **Table 2** the results of the cross-tabulation between students of Social Sciences and Sciences Faculties and Louis Pasteur’s answer about the concept of discovery are presenting. Specifically Louis Pasteur was asked: “How did you manage to do all these discoveries? Did luck help you?” And he replied: “Luck helps pre-prepared thought”.

The results did not reveal the existence of statistically significant differences (Pearson Chi-square  $\chi^2 = 2.260$ ,  $df 1$ , ns) between students of different Faculty. In particular, based on participants’ answers it seems that students of both Social as well as Scientific Faculty, support, at a higher percentage, that from the words of Pasteur appears that luck is an effort product, while few students state the opinion that great discoveries happen randomly and unexpectedly.

**Table 3** presents the results of cross- tabulation between the views of students in Departments of Social and Scientific Faculty and the conditions of creative production, completion of an original artistic or scientific product. The results of the cross-tabulation did not reveal the existence of statistically significant differences (Pearson Chi-square  $\chi^2 = 2.624$ ,  $df 1$ , ns) between

**Table 1.**

Cross-tabulation between students of social sciences and sciences faculties and the method of studying: number, percentage frequency and statistical significance.

Study method		Students		
		Social sciences	Sciences	Total
Fast & effective	Number	100	74	174
	% Method	57.5%	42.5%	100.0%
	% Direction	20.8%	21.6%	21.1%
Fast & ineffective	Number	271	190	461
	% Method	58.8%	41.2%	100.0%
	% Direction	56.5%	55.4%	56.0%
Fast & creative	Number	109	79	188
	% Method	58.0%	42.0%	100.0%
	% Direction	22.7%	23.0%	22.8%
Total	Number	480	343	823
	% Method	58.3%	41.7%	100.0%
	% Direction	100.0%	100.0%	100.0%
<b>Statistical significance index</b>				

Note: Pearson Chi-square  $\chi^2 = .102$ ,  $df 2$ , ns.

**Table 2.**

Cross-tabulation between students of social sciences and sciences faculties and louis pasteur’s answer: number, percentage frequency and statistical significance.

		Students		
		Social sciences	Sciences	Total
Discoveries happen randomly	Number	48	24	72
	% Answer	66.7%	33.3%	100.0%
	% Direction	10.0%	7.0%	8.7%
Luck is an effort product	Number	432	319	751
	% Answer	57.5%	42.5%	100.0%
	% Direction	90.0%	93.0%	91.3%
Total	Number	480	343	823
	% Answer	58.3%	41.7%	100.0%
	% Direction	100.0%	100.0%	100.0%
<b>Statistical significance index</b>				

Note: Pearson Chi-square  $\chi^2 = 2.260$ ,  $df 1$ , ns.

**Table 3.**

Cross-tabulation between students of social sciences and sciences faculties and the conditions of completion of an original artistic or scientific product: number, percentage frequency and statistical significance.

		Students		
		Social sciences	Sciences	Total
Unique talent— inherent charisma	Number	91	81	172
	% Condition	52.9%	47.1%	100.0%
	% Direction	19.0%	23.6%	20.9%
Cultivation & learning	Number	389	262	651
	% Condition	59.8%	40.2%	100.0%
	% Direction	81.0%	76.4%	79.1%
Total	Number	480	343	823
	% Condition	58.3%	41.7%	100.0%
	% Direction	100.0%	100.0%	100.0%

#### Statistical significance index

Note: Pearson Chi-square  $\chi^2 = 2.624$ ,  $df 1$ , ns.

students of different Faculty, where it seems that they express the opinion at a higher percentage that it is the outcome of cultivation and learning and to a smaller degree that it is a unique talent which features an inherent charisma.

#### Insistence-Tolerance in Uncertainty: Differences between Students of Sciences and Social Sciences Faculties

**Table 4** presents the differences in the answers of students of Social Sciences and Sciences Faculties as far as the desirable place of work after the completion of their studies. The results revealed the existence of statistically significant differences between students and they show that students who study in Social Science Faculties wish to a greater degree to work after the completion of their studies at the public sector, whilst on the other side students of Sciences Faculties wish to a greater extent to work at the private sector, in a personal and/or a family business.

**Table 5** presents the results of the cross-tabulation analysis between students in Social Sciences and Sciences Faculties and the selection criteria among different jobs. The results of the cross-classification supported the existence of statistically significant differences (Pearson Chi-square  $\chi^2 = 18.907$ ,  $df 1$ ,  $p < .001$ ) among students of different faculties. Specifically, based on participants' answers it seems that students of Science Faculties prefer to a greater degree a funded program for their own entrepreneurial task, whilst on the other side students of Social Science Faculties prefer, to a greater degree, a steady job with a salary and stamps.

The results of the cross-tabulation of the students of Social Sciences and Sciences Faculties and the selection criterion of a scientific job are being presented in **Table 6**. Specifically, the results of the cross-classification supported the existence of statistically significant differences (Pearson Chi-square  $\chi^2 = 10.651$ ,  $df 1$ ,  $p < .001$ ) among students of different faculties. In particular, participants' answers indicated that students of Science Faculties select to a greater extent scientific jobs that are challenging, whilst on the other side students of Social Science

Faculties prefer jobs where they feel confident to cope successfully with their demands and they can complete them.

#### Discussion

Variations are being observed between students of different Faculties and the examined variables. More precisely, it appears that undergraduate students of Social Science studies select a more stable job with a salary and stamps, against a funded program for a personal entrepreneurial endeavor, which is mostly within the choices of students in Science Studies. The results showed that the type and nature of studies, potentially the content of the study courses as well, affects and their choices regarding the type and nature of the job they wish to practice after the graduation. Relevant to this appear the criteria that students use to select a scientific job within the university. Confidence, completion certainty plays an important role despite the attractiveness and the initiative possibility for the undergraduate students of Social Science studies.

The more "conservative" views, as are being expressed from the undergraduates of Social Science Faculties, are likely due to the content of studies, but also to the lack of alternative channels of professional career relating to the desirable, for instance, choice of the public sector and the confidence of a salary. However, the gender role must also be examined. It seems that the woman population outweighs not only as far as the sample concerns but mostly as far as the social orientations of the department are concerned, where the vast majority are women. Regardless the faculty, students support the significance of the effort, the preparation and the learning as important facts of innovation and creative production.

Despite the equivalent professionalization of the women population and their contribution to the family fund, men seem to hold more the economy wheel within the Greek family, with the consequence to be more adventurous, open to experience and risk taking in business, with the aim to increase the family planning. In today's rough socio-economical circumstances that the current research took place, the respondents, especially women, express both the personal and the corporate uncertainty

**Table 4.**

Mean rank and differences (Mann Whitney, Z) in the answers of students of social sciences and sciences faculties who would wish to work after the completion of their studies.

	Students			
	Social sciences (mean rank)	Sciences (mean rank)	Mann-Whitney	Z
Private sector	343.87	507.34	49617.000	-10.018***
Public sector	476.37	321.92	51421.000	-9.718***
Personal business	369.80	471.05	62066.000	-6.180***
Family business	366.01	476.36	60245.000	-6.822***

Note: \*\*\* $p < .001$ , \*\* $p < .01$ , \* $p < .05$ .

**Table 5.**

Cross-tabulation among students of social sciences and sciences faculties and the selection among jobs: number, percentage frequency and statistical significance.

		Students		
		Social sciences	Sciences	Total
<b>Funded program for a personal entrepreneurial task</b>	Number	142	152	294
	% Choice	48.3%	51.7%	100.0%
	% Direction	29.6%	44.3%	35.7%
<b>Steady job with a salary and stamps</b>	Number	338	191	529
	% Choice	63.9%	36.1%	100.0%
	% Direction	70.4%	55.7%	64.3%
<b>Total</b>	Number	480	343	823
	% Choice	58.3%	41.7%	100.0%
	% Direction	100.0%	100.0%	100.0%

**Statistical significance index**

Note: Pearson Chi-square  $\chi^2 = 18.907$ ,  $df 1$ ,  $p < .001$ .

**Table 6.**

Cross-tabulation among students of social sciences and sciences faculties and the selection criterion of a scientific job: number, percentage frequency and statistical significance.

Selection criterion of a scientific job		Students		
		Social sciences	Sciences	Total
<b>Challenging job</b>	Number	142	139	281
	% Choice	50.5%	49.5%	100.0%
	% Direction	29.6%	40.5%	34.1%
<b>Completion confidence</b>	Number	338	204	542
	% Choice	62.4%	37.6%	100.0%
	% Direction	70.4%	59.5%	65.9%
<b>Total</b>	Number	480	343	823
	% Choice	58.3%	41.7%	100.0%
	% Direction	100.0%	100.0%	100.0%

**Statistical significance index**

Note: Pearson Chi-square  $\chi^2 = 10.651$ ,  $df 1$ ,  $p < .001$ .

with unemployment horizons, part-time work with a minimal salary at best, get stuck in the tested path, the certain, the conventional, the one that is not at all challenging and interesting. Therefore, they nullify, despite their juvenile, the adventure, the risk, the openness of prospects with individual accomplishments. It is the generation of 400 and something euros.

## REFERENCES

- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of Management Journal*, 39, 1154-1184. [doi:10.2307/256995](https://doi.org/10.2307/256995)
- Di Tella, R., & MacCulloch, R. (2006). Some uses of happiness data in economics. *Journal of Economic Perspectives*, 20, 25-46.
- [doi:10.1257/089533006776526111](https://doi.org/10.1257/089533006776526111)
- Grossman, S., & King, M. (1990). Eagles, otters, and unicorns: An Anatomy of innovation. *Journal of Creative Behavior*, 24, 75-98. [doi:10.1002/j.2162-6057.1990.tb00530.x](https://doi.org/10.1002/j.2162-6057.1990.tb00530.x)
- OECD (2006). *Competitive cities in the global economy*. Paris: OECD.
- Phelps, E. (2007). Entrepreneurial culture: Why European economies lag behind the US. *Wall Street Journal*.
- Puccio, G., Murdock, M., & Mance, M. (2007). *Creative leadership: Skills that drive change*. London: Sage Publications.
- Shahid, Y. (2009). From creativity to innovation. *Technology in Society*, 31, 1-8. [doi:10.1016/j.techsoc.2008.10.007](https://doi.org/10.1016/j.techsoc.2008.10.007)
- Von Stamm, B. (2008). *Managing innovation, design and creativity*. West Sussex: John Wiley & Sons.
- Xanthacou, Y., & Kaila, M. (2011). *Creative problem solving*. Hauppauge, NY: Nova Science Publishers, Inc.