Social Sciences

FOSTERING CREATIVITY THROUGH EDUCATION – KEY FACTORS, AND ACTION DIRECTIONS

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ABSTRACT:
THOUGH MOST RESEARCHERS AGREE THAT CREATIVITY CAN BE THOUGHT, THERE ARE VERY FEW EDUCATIONAL INITIATIVES SPECIFICALLY AIMED TO IMPROVE CREATIVITY OF THE STUDENTS., THIS PAPER IS A BRIEF REVIEW OF THE VAST LITERATURE DEDICATED TO THE STUDY OF CREATIVITY FROM A PRACTICAL PERSPECTIVE, AIMING TO IDENTIFY THE FACTORS THAT INFLUENCE CREATIVITY IN A POSITIVE OR NEGATIVE WAY, AND TO DERIVE ACTION DIRECTIONS FOR FOSTERING CREATIVITY IN THE EDUCATIONAL CONTEXT.
AN IMPORTANT CONCLUSION OF THIS STUDY IS THAT, THOUGH INTENSELY CRITICIZED FOR BLOCKING THE INNATE CREATIVITY OF THE CHILDREN, A REFORMED SCHOOL, WITH SPECIALLY TRAINED TEACHERS, SEEMS TO REMAIN THE MOST IMPORTANT SOCIAL INSTRUMENT FOR PROMOTING CREATIVITY OF THE STUDENTS ON A LARGE SCALE.

KEY WORDS: EDUCATION FOR CREATIVITY, INNOVATION, MODELS OF CREATIVITY AND INNOVATION, FACTORS OF CREATIVITY, ACTION DIRECTIONS TO FOSTER CREATIVITY

I. INTRODUCTION

The research described in this paper was carried out in the context of the Leonardo da Vinci project titled "*TECRINO- Teaching Creativity in Engineering*", and records the results of the study regarding the state of the art in fostering creativity and innovation through education. The final goal of this project is to develop educational content intended for both teachers and students, specially designed to improve the creativity, and to make this content compatible with an open source e-learning platform.

The idea to foster creativity of the students through education is not new. Back in 1965, Bruner[3] argued that children should be encouraged to "treat a task as a problem for which one invents an answer, rather than finding one out there in a book or on the blackboard". Four decades later Scott[4] unequivocally confirmed Bruner's idea and concluded: "Thus, creativity training appears beneficial for a variety of people, not just elementary school students or the unusually gifted. Taken as a whole, these observations lead to a relatively unambiguous conclusion: *Creativity training works*".

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[3] Bruner, *The growth of mind*.
[4] Scott, G., Leritz, L. E., & Mumford, M. D. *The effectiveness of creativity training*

However, the idea of creating "a textbook of creativity" doesn't seem to be an easy task. Xu[5] made a thorough inventory of the courses dedicated to fostering creativity in universities from North America, Europe, Japan, and China. Surprisingly, the resulting list includes only 39 courses, and in most cases these were organized by individual professors well known for their interest in the research of creativity.

Under these circumstances a decline of creativity is possible, and even predictable. Bronson et al. (*http://www.newsweek.com/2010/07/10/thecreativitycrisis.html, accessed March, 2014*) note that in North America, after 1990 there is a visible increase of the intelligence quotient IQ, accompanied by a constant decrease of the creativity quotient, measured with the Torrance Test of Creative Thinking (TTCT[6]). The causes of this phenomenon are still unclear, but the effects may be severe and require energetic actions. Bronson concludes that "while our creativity scores decline unchecked, the current national strategy for creativity consists of little more than praying for a Greek muse to drop by our houses."

In this context, the present paper aims to be a first small step towards organizing the vast literature about creativity so that some essential action directions become obvious.

Beyond this introduction, this document is structured as follows:

- Section II describes the general conceptual framework, and formulates clear options for the definitions and models of the main concepts discussed.
- Section III identifies the key factors influencing the creativity, and derives several action directions to foster creativity through education.
- Section IV is reserved for conclusions.

II. CONCEPTUAL FRAMEWORK. DEFINITION AND MODEL OF CREATIVITY

By comparing the Forbes list of most powerful brands (http://www.forbes.com/powerful-brands/list/), and the list of most innovative companies according to Boston Consulting Group (http://www.forbes.com/sites/susanadams/2013/09/27/is-apple-the-worlds-most-innovative-company-still/), as shown in Table 1, two things become obvious: first that there is a strong correlation between the capacity of the companies to generate (and absorb) innovation, and their economic power, and on the other hand, that there is a large disparity between the USA and the rest of the world in this direction.

This conclusion is almost a literal transcription of an idea formulated 10 years ago by Hargreaves[7]: "we live in a knowledge economy, a knowledge society. Knowledge economies are stimulated and driven by creativity and ingenuity. Knowledge society schools have to create these qualities, otherwise their people and their nations will be left behind" .

[5] Xu, F., McDonnell, G., & Nash, W. R. (2005). A survey of creativity courses at universities in principal countries. *The Journal of Creative Behavior, 39(2)*

[6] Torrance E. P. (1966). *The Torrance Tests of Creative Thinking, Princeton*

[7] Hargreaves, A. (2003). *Teaching in the knowledge society* Teachers College Press.

Table 1. List of most powerful brands, versus most innovative companies in 2013 (Sources: Forbes and Boston Consulting Group)

Rank	*Most Innovative Companies (BCG)*	*Most Powerful Brands (Forbes)*
1	Apple	Apple
2	Samsung	Microsoft
3	Google	Coca-Cola
4	Microsoft	IBM
5	Toyota	Google
6	IBM	McDonalds
7	Amazon	General Electric
8	Ford	Intel
9	BMW	Samsumg
10	General Electric	Louis Vuitton

In this society, the key resource for progress is no longer capital or labor – is innovation[8].

But what exactly is "innovation", and how is this concept related to "creativity", and "invention"?

Two comprehensive and valuable works: "The Oxford Handbook of Innovation[9]" and "The Cambridge Handbook of Creativity[10]" provide an extensive analysis of the many definitions proposed in the literature for these concepts. We will not reproduce this analysis here for lack of space, and in this study we will adopt the definitions of creativity and innovation proposed by Teresa Amabile[11]:

"Creativity is the production of novel and useful ideas in any domain", and "Innovation is the successful implementation of creative ideas within an organization".

Jan Fagerberg[12] brings supplementary clarification by emphasizing the difference between "*invention"* and "*innovation*": "*Invention is the first occurrence of an idea for a new product or process. Innovation is the first commercialization of the idea.*"

Thus, the creativity is the process of developing ideas that are simultaneously novel, and valuable from a practical perspective (the inventions), while the innovation is the process of capitalization of the results within an organization.

Many researchers[13] made a distinction between "Creativity" (with capital letter) – called "the big C", which designates exceptional results (e.g. the works of Shakespeare, Leonardo da Vinci, Michelangelo, Einstein, etc.) and "the little c"), which defines the everyday creativity, accessible to almost all people (e.g. create a new culinary recipe, find an original interior design solution, etc.). Most researchers agree that "the little c" can be acquired and developed through education, and, along this study, we will use the term "creativity" in this acception.

[8] Drucker, P. (1993). *Post-capitalist Society*. New York: Harper Collins

[9] Fagerberg, J.; Mowery, D. C.; Nelson, R. (ed.). *The Oxford handbook of innovation.* Oxford Handbooks Online, 2006

[10] Sternberg, R. J. (ed.). *Handbook of creativity*. Cambridge University Press, 1999.

[11] Amabile, T. M. *Creativity and innovation in organizations*. Harvard Business School, 1996.

[12] Fagerberg, J. (2004). *Innovation: a guide to the literature (*http://smartech.gatech.edu/handle/1853/43180)

[13] Kaufman, J. C.; Beghetto, R. A. *Beyond big and little: The four C model of creativity.* Review of General Psychology, 2009, 13.1

A simple model of the creativity was proposed by Amabile [14](see figure 1.) According to this model, the creativity has three components:

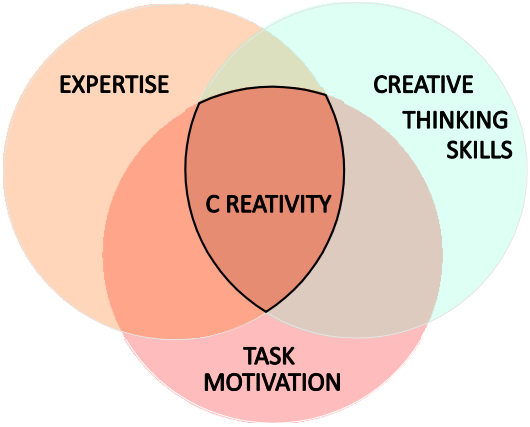

Fig. 1 The components of creativity (Amabile, 1996)

- *The Expertise* is the individual knowledge base that is the starting point of any creative processing of the information. Nothing can be built in the absence of a foundation. One cannot be creative, for example in organic chemistry, without a solid knowledge of the functional groups, and, generally speaking, it is not possible to reach performance in any domain, without having a good knowledge of the state of the art in that field.
- *Creative thinking skills*. This component of the creativity is defined by a specific way of processing the information from the knowledge base, which is favorable to using new perspective on the problems, and to following new cognitive paths. The creative thinking skills can be – in principle – improved by learning specific heuristics, but, in the same time are influenced by a series of personality traits such as independence, the capacity to take moderate risks, the ability to tolerate ambiguity, etc.
- *Motivation* is the "energy source" of any human endeavor. Though there are many studies proving that incentives (a typical extrinsic motivation, see the definitions in Ryan[15]) may stimulate, or even -in certain conditions- may inhibit creativity, most researcher agree that intrinsic motivation is preferable as element that stimulates creativity.

Though very simple, the Amabile model of creativity has the advantage that it clearly shows several means to influence the creativity in the educational process: the expertise can be improved by an efficient design of the curriculum, the creative thinking skills can be acquired by learning and practicing some specific heuristics, and the motivation of the students can be addressed by adjusting the educational environment from an organizational perspective[16].

III. ANALYSIS OF THE KEY FACTORS INFLUENCING THE CREATIVITY

Though the majority of researchers agree that the education for creativity is possible and desirable, there are numerous opinions that the school as institution and the teachers as educational agents are incapable to foster creativity of the students and they are even responsible for repressing and even annihilating the innate creativity of the children.

[14] Amabile T.M. Op.cit. (1996)
[15] Ryan, R. M.; Deci, E.L. *Intrinsic and extrinsic motivations: Classic definitions and new directions*. Contemporary educational psychology, 2000, 25.1
[16] Maehr, M. L.; Midgley, C. *Enhancing student motivation: A schoolwide approach.* Educational Psychologist, 1991, 26.3-4

So, before trying to analyze the means to stimulate creativity in school, we should first try to understand the factors that act towards blocking or repressing the creativity of the students.

Sir Ken Robinson [17] formulates severe critics of the institution of modern school, and says that: *"We have sold ourselves into a fast food model of education, and it's impoverishing our spirit and our energies as much as fast food is depleting our physical bodies."*

The solution, according to Robinson, is to abandon the paradigm of the school as a factory: "The fact is that given the challenges we face, education doesn't need to be reformed – it needs to be transformed. The key to this transformation is not to standardize education, but to personalize it, to build achievement on discovering the individual talents of each child, to put students in an environment where they want to learn and where they can naturally discover their true passions[18]."

In summary, the main factors that act as inhibitors of creativity in the educational process are (see also Cachia[19], and Craft[20]):

- The prescriptive environment of the school;
- The curriculum oriented towards quantity rather than quality of the information;
- The lack of consensus regarding the definition and the model of mental processes associated with creativity;
- A certain confusion of values: teachers frequently perceive some behaviours or personality traits specific to creative students (e.g. stubbornness, hyperactivity, argumentiveness, and independence) as "misbehaviors".
- Teachers are not trained to foster creativity of students: though most of them claim they encourage students to be creative, they simply don't know how to do this;
- The lack of quality educational content for teaching creativity. Teachers and students are equally in need of such materials;
- The lack of simple and easy to use instruments for the assessment of creativity;
- The lack of IT&C tools to support teaching for creativity.

By analyzing the list above, one can easily notice that the inhibiting factors are related to the educational environment, and to the professional abilities of the teachers. But the influence of the educational environment on creativity is not necessarily negative. Environment factors may be an efficient instrument to foster creativity. Davies et al.[21] count the following positive factors:

- Flexible use of time and space;
- availability of appropriate materials;
- working outside the classroom/school;
- 'playful' or 'games-bases' approaches with a degree of learner autonomy;
- respectful relationships between teachers and learners;
- opportunities for peer collaboration;
- partnerships with outside agencies;
- awareness of learners' needs, and nonprescriptive planning."

[17] Robinson, K. *The Element: How Finding Your Passion Changes Everything*. Penguin. com, 2009
[18] Robinson K. Op. cit., (2009)
[19] Cachia, R. et al. (2009). *Creativity in schools in Europe: A survey of teachers in Europe*
[20] Craft, A.. *The limits to creativity in education: Dilemmas for the educator*. British Journal of Educational Studies, 2003, 51.2
[21] Davies, Det al. (2012). *Creative Learning Environments in Education–a systematic literature review*. Thinking Skills and Creativity

Other researchers indicate a variety of other factors that can influence creativity in school:

- Moods [22]and emotions ;
- Pattern recognition and "visual thinking[23]";
- Organizational and institutional influences[24];
- Teamwork [25];
- Some cultural factors [26];
- The ability to use certain heuristics, e.g. TRIZ[27].

And, last but not least, an essential factor that could dramatically impact the future of teaching for creativity is the use of ICT in education (Ala-Mutka[28], Loveless[29], Jahnke[30], Roschelle[31], Thompson[32]).

Therefore, we suggest that the model of creativity proposed by Amabile can be extended to include these factors (see figure 2).

By analyzing the factors that influence – in both positive and negative directions – the education for creativity, the following action directions for fostering creativity through education become obvious:

1. Eliminate the factors that inhibit creativity. The responsibility for this lies with the decision makers at the European, national, and organizational level, and – to a certain degree – with the teachers, who should contribute to the creation of a less-prescriptive educational environment. In this category of measures, we count: the reform of the curriculum, defining and promoting a respectable social status for the teachers, which includes decent salarization, increasing the autonomy of the public schools, etc.

[22] Newton, D. P. (2012). *Moods, emotions and creative thinking: A framework for teaching.* Thinking Skills and Creativity.

[23] Hong, F.T. (2013) *The role of pattern recognition in creative problem solving: A case study in search of new mathematics for biology*, Progress in Biophysics and Molecular Biology 113

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[27] Altshuller, G. S. (1996). *And suddenly the inventor appeared*

[28] Ala-Mutka, K et. al.. (2008). *ICT for learning, innovation and creativity*

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[30] Jahnke, I. (2011). *How to Foster Creativity in Technology Enhanced Learning.* In Social media tools and platforms in learning environments. Springer Berlin Heidelberg

[31] Roschelle, J. M. et. al. (2000). *Changing how and what children learn in school with computer-based technologies*. The future of children

[32] Thompson, P., & Randall, B. (2001). *Can E-Learning Spur Creativity, Innovation and Entrepreneurship?*. Educational Media International, 38(4)

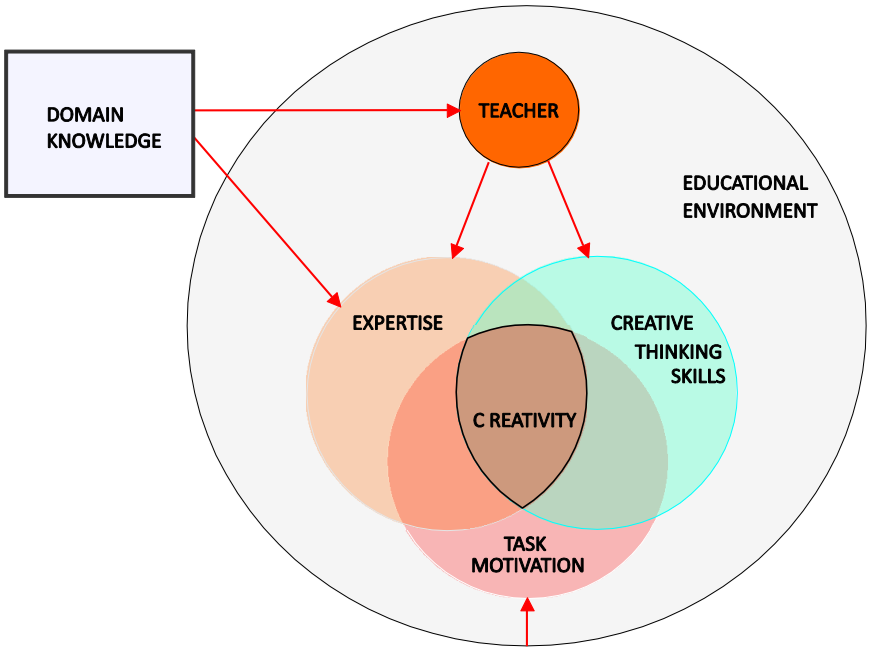

Fig. 2 The proposed extended model of creativity in the educational context

2. Attract teachers in CPD (Continuous Professional Development) courses to help them understand the psychological mechanisms involved in creativity.
3. Develop educational content specially aimed for the education for creativity. This includes both courses for teachers, and specific courses for students designed to improve their creative thinking skills, and help them acquire certain specific heuristics.
4. Develop solutions based on IT&C to promote creative problem solving in education.
5. Develop simple and easy to use IT&C tools for the assessment of creativity.

Ala-Mutka et al[33]. extend the responsibility from teachers to policymakers, researchers, and other practitioners, who "should engage in developing a common vision of future learning for innovation, as a tool to guide their joint effort".

V. CONCLUSION

The implementation of the concept of *"education for creativity and innovation"* seems to require a clear vision and convergent efforts of the researchers, decision makers and teachers in order to adjust the learning environments and to create dedicated content aimed to foster creativity.

In this context, the Information and Computer Technology appears to be a promising instrument to deliver the educational content, to promote creative interactions between learners, and to measure the progress.

Though intensely criticized for blocking the innate creativity of the children, a reformed School, with specially trained teachers, seems to remain the most important social instrument for promoting creativity of the students on a large scale.

[33] Ala-Mutka et al. *ICT for learning, innovation and creativity* (2008)

ACKNOWLEDGEMENT

This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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