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## Initiatives towards an education for creativity

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### Abstract

We have tried to approach the problem of fostering creativity in education from two distinct directions: First, in the project “iLab2 - Innovation Laboratories for the quality assurance of vocational education and training”, we acted on the learning environment. Then, in the project “Tecrino – teaching creativity in engineering”, we are working to create specially designed educational content for both teachers and students. This paper presents the philosophy and the preliminary results of these projects and suggests that a reformed school seems to be the only efficient social instrument for promoting creativity on a large scale.

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### 1. Beyond the fast-food model of education

The school as a factory paradigm has been highly effective in terms of “productivity”, by ensuring – for over a century – a minimum level of uniform education for billions of people.

Nowadays, after more than 100 years after the moment when this concept was first formulated (Marshall, 1911), the “school systems [still] base education on the principles of the assembly line and the efficient division of labor. Schools divide the curriculum into specialist segments: some teachers install math in the students, and others install history. [...] Students are educated in batches, according to age, as if the most important thing they have in common

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is their date of manufacture. They are given standardized tests at set points and compared with each other before being sent out onto the market. (Robinson, 2009).

But the world changed a lot in the past 2-3 decades. “We are shifting from an economy based on physical inputs—land, capital, and labor—to an economy based on intellectual inputs, or human creativity. [...] We will not grow our economy, we will not become more prosperous, unless we further develop all of our human creative capabilities.” (Florida, 2006).

“Our own times are being swept away along an avalanche of innovations in science, technology, and social thought. To keep pace with these changes, we need to keep all our wits about us— literally. We must learn to be creative.” (Robinson, 2011).

“Today’s students are growing up in a world that is very different from the world of their parents and grandparents. To succeed in today’s Creative Society, students must learn to think creatively, plan systematically, analyze critically, work collaboratively, communicate clearly, design iteratively, and learn continuously. Unfortunately, most uses of technologies in schools today do not support these 21st-century learning skills. In many cases, new technologies are simply reinforcing old ways of teaching and learning.” (Resnick, 2007).

But creativity, which involves originality, uniqueness, is fundamentally incompatible with the uniformity and standardization of the products of the school-factory. Beyond the variously specific topics, what the schools primarily teach is a way of thinking based on logic, mathematics, and deductions, i.e. a way of thinking based exclusively on the left brain hemisphere. In summary, the school teaches us to think with half the brain.

The contradiction between the requirements of a fast changing society, and the generations of people with half brains was –temporarily – solved in two ways: initially, the developed countries encouraged the migration of highly skilled people from developing countries, then – as “the world became flat” through globalization (Friedman, 2006) – the practice of outsourcing replaced departments, plants, or even entire enterprises with equivalent (but cheaper) structures from India, China, Eastern Europe.

Obviously, this was only a way to circumvent the problem : the real solution is a radical reform of the school to make it compatible with creativity.

The idea to foster the creativity of the students in the educational process is not new. Back in 1965, Bruner was arguing that children should be encouraged “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” (Bruner, 1965). Four decades later, Scott confirmed unequivocally Bruner’s thesis and concluded that “... 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”. (Scott et al., 2004).

Though the majority of researchers agree that the education for creativity is possible and desirable, there exist prominent opinions (see Robinson, 2011), according to which the school as institution, and the teachers as educational agents are not just unable to foster the creativity of the students, but also they seem responsible for repressing – or even annihilating it.

Thus, before analyzing the means to stimulate creativity in school, we should first try to understand the factors through which the school acts towards blocking or repressing the creativity of the students.

In a comprehensive study regarding the creativity in schools across Europe, Cachia et al. interviewed over 7000 teachers from 27 UE countries. The conclusions of this study (Cachia, 2009), sponsored by the European Commission Joint Research Centre, Institute for Prospective Technological Studies (JRC-IPTS) are quite interesting and worth to reproduce here: “Members States should engage in providing training for teachers on how to foster creativity in learners” [...] “To achieve this goal [Europa 2020 strategy], Member States should commit to re-thinking curricula in order to clearly enable creative learning practices. [...] Curricula should allow flexibility, time and space to develop transversal skills and not overload teachers and learners with content.”

In a similar study – but at much smaller scale – (Aljughaiman, 2005) the authors reach similar conclusions regarding the situation of public schools in the United States: “Teachers feel ill-prepared to foster creativity when they do not know how to define creativity, recognize creativity, appreciate creative behaviors, or are overburdened with the demands of teaching content driven curricula toward high stakes testing.”

In summary, the main factors that act as obstacles to an education for creativity are as follows (see also Parkhurst, 1999; Craft, 2003; Sternberg, 2010; Mueller 2012):

- The confusion and lack of consensus regarding the definition and the assessment of creativity (see figure 1);
- The curriculum oriented towards quantity rather than quality of the information;
- A certain bias against creativity: teachers frequently perceive some behaviors or personality traits specific to creative students (e.g. stubbornness, hyperactivity, argumentativeness, and independence) as disruptive “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;
- Teachers are not motivated to promote creativity;
- 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.

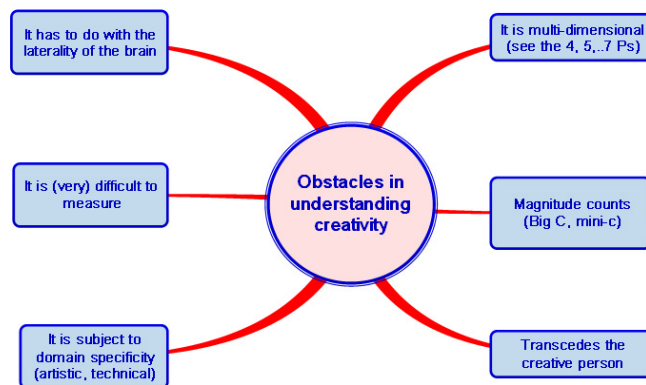


Fig. 1. Main obstacles in understanding creativity.

The solution, according to Ken Robinson, is to entirely 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.” (Robinson, 2009)

Obviously, this is not an easy task and require synergistic efforts of researchers, decision makers, and educators of all levels.

In this context, this paper presents two initiatives aimed to identify the action directions and to make a few significant steps towards fostering creativity in technical education.

Beyond this introduction, this work is structured as follows:

Section 2 is a brief review of the literature, in search of practical action directions to promote creativity in the educational context.

Section 3 describes the philosophy of the “innovation laboratories”, or “iLab’s”.

Section 4 presents the objectives of the project “Tecrino – teaching creativity in engineering”.

Finally, section 5 is reserved for conclusion.

## 2. Is teaching creativity like lecturing birds on flying?

Undoubtedly, almost every individual has – *potentially* – the capacity to lead a creative life. But the specific way this potential comes to materialize mainly depends on two important factors: one is education, and the other is sheer luck (see Csikszentmihalyi, 1997). Though it may be interesting to explore the link between the creative mind and the “lucky mind” (Wiseman, 2004), this analysis is beyond the scope of this paper. Therefore, we focused on the role of education on the development of creativity, and – after reviewing some of the vast literature on this topic (Sternberg, 2010; Craft, 2003; Groth, 1999; Beghetto, 2005; Mueller, 2011; DeHaan, 2005; Handelsman, 2004; Hargraeves, 2007; DeHaan, 2009; Amabile, 1996; Amabile, 1998; Runco, 2014; Susnea, 2014) – we derived several action directions for each class of agents involved in the process: educators, researchers, and decision makers. The findings of this study are synthetically presented in the mind map depicted in figure 2.

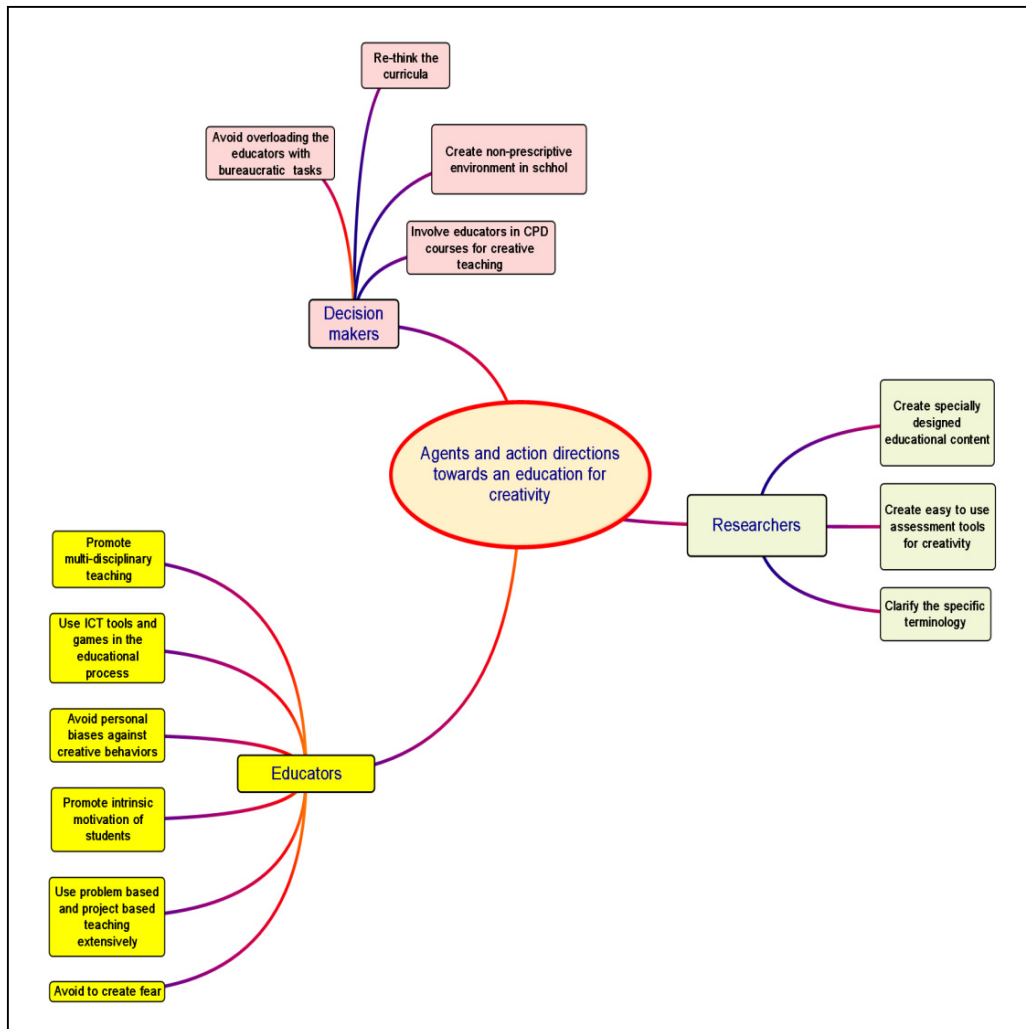


Fig. 2 Main agents and respective action directions towards an education for creativity

Thus, the answer to the (rhetorical) question in the title of this section is definitely: “No”. As Robert DeHaan notices in (DeHaan, 2009): “Students need to be repeatedly reminded and shown how to be creative, to integrate material across subject areas, to question their own assumptions, and to imagine other viewpoints and possibilities.” From this perspective, the education for creativity appears to be mandatory for any student in order to give him a chance to materialize his potential for a creative life.

Scott et al. (Scott, 2004) analyzed 70 courses aimed to enhance the overall creativity of students of all ages. They concluded that the instruction for creativity can be highly effective in what concerns enhancing divergent thinking, problem solving, and most importantly, problem finding, conceptual combination, and idea generation.

As Ken Robinson noticed, education is a future oriented business: “children starting school this year will be retiring in 2065. Nobody has a clue, [...] what the world will look like in five years’ time. And yet we’re meant to be educating them for it.”

And, in this rapidly changing world, the future is shrouded in clouds of uncertainty, and full of risks. While – in some cases – 80% of all that students learn during their studies for a bachelor degree is already obsolete by the time of their graduation, the creative thinking skills they acquired in school remain their only instrument for coping with the uncertainties and risks of the future. This makes the education for creativity a moral responsibility of the educators.

### 3. The philosophy behind the innovation laboratories – iLabs

The environment (“place”) is known to be one of the four fundamental P’s of the concept of creativity. In a comprehensive literature review on the influence of the learning environment in education, Davies et al. (2013) found that the environment not only affects the attainment of students, but also the development of teachers’ professionalism.

Among other factors, they emphasized the importance of the following:

- flexible use of space and time;
- availability of appropriate materials;
- working outside the classroom/school;
- opportunities for peer collaboration;
- non-prescriptive planning

These features describe an “extraordinary space”, blatantly different from the rather dull, and highly prescriptive environment of an average school. By adding two more elements to this space, namely a set of software tools designed to facilitate communication and teamwork, and a “facilitator” we get an equation that defines an iLab:

$$iLab = \text{Extraordinary environment} + \text{Technology} + \text{Facilitation techniques}$$

The technology involved in iLabs consists in a set of computers with multimedia peripherals and special software designed to allow anonymous participation to discussions, and easy recording of ideas.

The third term of the sum in the equation that defines an iLab, facilitation is the overall management of the resources, along with influencing the group dynamics in order to obtain the most of the group’s creative capabilities.

Historically, the concept of iLab was first introduced in 1997, by the Royal Mail’s Futures and Innovation Group in Rugby, U.K., as an aid for the management team to brainstorm future possibilities. It was later used with great success in a variety of other purposes such as: strategy planning, summer schools, focus groups, staff development etc.

The philosophy behind iLab seems to derive from the so-called “construal level theory” (CLT) (Trope, Y., & Liberman, N. 2010), which states that an increased *psychological distance* – defined as perceptual detachment from a certain problem or context- can positively influence creativity. The iLabs attempt to artificially increase the psychological distance by inducing to the users the feeling of being “somewhere else”, away from the current environment and the everyday problems.

Another strength of the iLab derives from its feature of anonymous brainstorming sessions: this allows the users to focus on the ideas rather than persons. The only weakness of this concept is its relatively high cost of implementation.

Building an iLab at the Department of Computer and Information Technology of the University “Dunarea de Jos” of Galati within the project “*iLab2 - Innovation Laboratories for the quality assurance of vocational education and training*” is the first step in a multi tier plan aiming to create long term facilities for an education for creativity.

#### 4. Towards a textbook of creativity

The project “*TECRINO- Teaching Creativity in Engineering*” primarily aims to create comprehensive educational content for teaching creativity, and make it freely available in 7 EU languages (Croatian, English, Greek, Polish, Portuguese, Romanian, and Spanish) by means of a dedicated e-learning platform.

The project will approach the problem of the education for creativity from both the perspectives of the teachers, and students. This will result in two distinct courses for educators and learners, both sharing the same practical methodology of learning by examples. Just like the creator of TRIZ, Genrich Altshuller analyzed over 40,000 patents in search of patterns of creative thinking, and distilled these patterns in just 40 principles of TRIZ, the Tecrino courseware will provide students with a wealth of examples of creative products and ideas from various domains (visual arts, science and technology, literature, etc.) with the intention to offer them the opportunity to re-discover the principles of inventive problem solving. The courses will cover most of the existing techniques for stimulating individual or group creativity, and will also present some IT&C tools known as creativity aid. A special chapter will present the main steps for writing and filing a patent application.

To conclude, Tecrino fills a knowledge gap by creating comprehensive and free educational content for teaching creativity.

#### 5. Conclusion

Initiatives for an education for creativity are no longer some fancy add-ons to otherwise dull and rigid curricula – they tend to become a stringent necessity, as it is obvious that creativity is the only instrument that enables today’s students to cope with the uncertainties of the future.

Though intensely criticized for killing the innate creativity of the students, a reformed School seems to remain the only institution capable to promote creativity on a large scale. This creates specific responsibilities for decision makers, educators, and researchers, and the modest attainment of the authors through the two Leonardo da Vinci projects demonstrate that something can be done in this direction.

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