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## **Creativity in managing innovative education based on the Smart-Up Lab program and Project Based Learning method**

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### **ABSTRACT**

Creativity is nothing but a mental process that entails the emergence of new ideas, concepts or new associations, links with existing ideas and concepts. Creative thinking is thinking that leads to original and appropriate solutions. In our dynamic and competitive world, designing a creative environment is a main goal and challenge for many companies and educational settings. Why is that so? Because it simply leads to the development of innovation and is existential for the well-being of the whole economy and civilization. One of the methods that contributes to the increase of creativity and the innovation level in education is the Project Based Learning (PBL) method. The aim of the study is to present creative methods in education based on PBL method using the example of the Smart-Up Lab (SUL) program organized by the consortium: Medical University in Lodz, Poland and EIT Health. PBL is a method of didactic work in which students implement the undertaking on the basis of assumptions established with the lecturer. At the beginning, goals and deadlines of work are set. The criteria for the assessment of individual work stages are clearly defined. The project's task is most often performed in a group. After the end of the project, the results of students' work are presented to the public. During the implementation of the project, the lecturer acts as a coordinator and consultant - helps in making decisions regarding the division of tasks, supervises deadlines and assesses student performance by giving feedback. One of the examples using the Project Based Learning method is the Smart-Up Lab project. This project uses creativity and the PBL method to

create innovative products, services and solutions to real-life challenges. This program has all features of a suitable teaching method in Science and may be a good example of the curriculum that may lead to the development of high-class specialists using creativity and innovative ideas in their everyday work.

**Keywords:** creativity, education, innovation, project based learning, Smart-Up Lab

## 1. INTRODUCTION

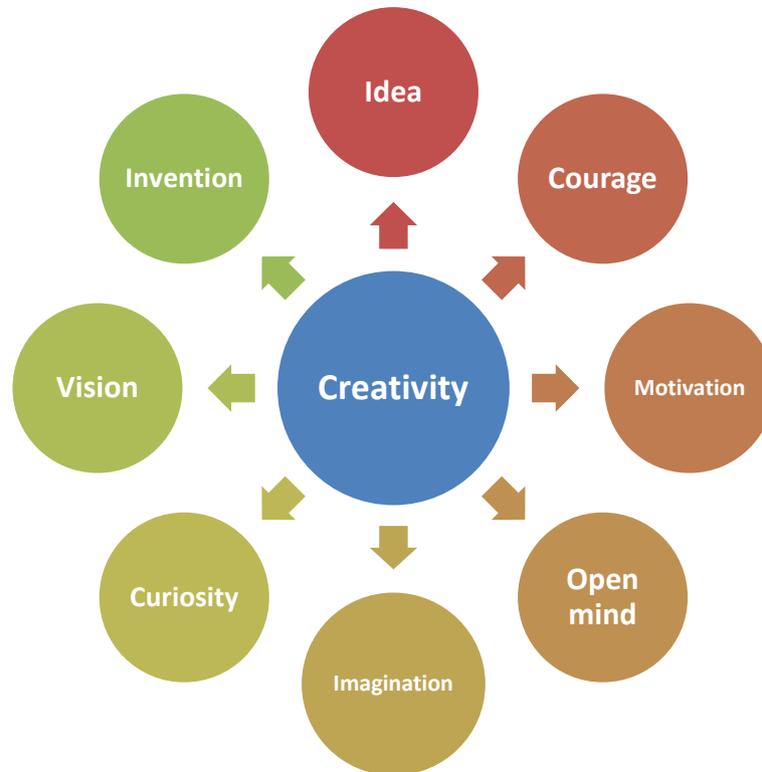
*„Creativity is the process of bringing something new into being. Creativity requires passion and commitment. It brings to our awareness what was previously hidden and points to new life. The experience is one of heightened consciousness: ecstasy.”* – Rollo May, *The Courage to Create*. [1] Creativity is thus nothing but a mental process that entails the emergence of new ideas, concepts, or new associations, links with existing ideas and concepts. Creative thinking is thinking that leads to original, witty and appropriate solutions. An alternative, more everyday definition of creativity says that it is simply the ability to create something new [2] or a new combination of something already existing. [3] According to Sternberg, creativity is a mixture of six separate but interrelated resources: intellectual skills, knowledge, thinking styles, personality, motivation and environment. [4] Bilton, however, stated that there are two aspects of creativity: difference and novelty. [5] Creativity is a trait that manifests itself in the way people manage their lives.

People who show creative behavior:

- ✓ face with status quo,
- ✓ confront the assumptions,
- ✓ show curiosity,
- ✓ like to explore new possibilities,
- ✓ usually take the initiative,
- ✓ have a tendency to think visually,
- ✓ see possibilities seemingly impossible,
- ✓ can be adapted to changing circumstances,
- ✓ see connections between seemingly disconnected elements,
- ✓ distill the unusual ideas according to their basic principles,
- ✓ they synthesize various elements,
- ✓ look beyond the first "right ideas".

They are:

- ✓ very clever
- ✓ not afraid of taking risks
- ✓ prepared to make mistakes
- ✓ adapted to different work environments
- ✓ able to recognize the patterns underlying the events
- ✓ able to cope with paradoxes
- ✓ oriented towards the future

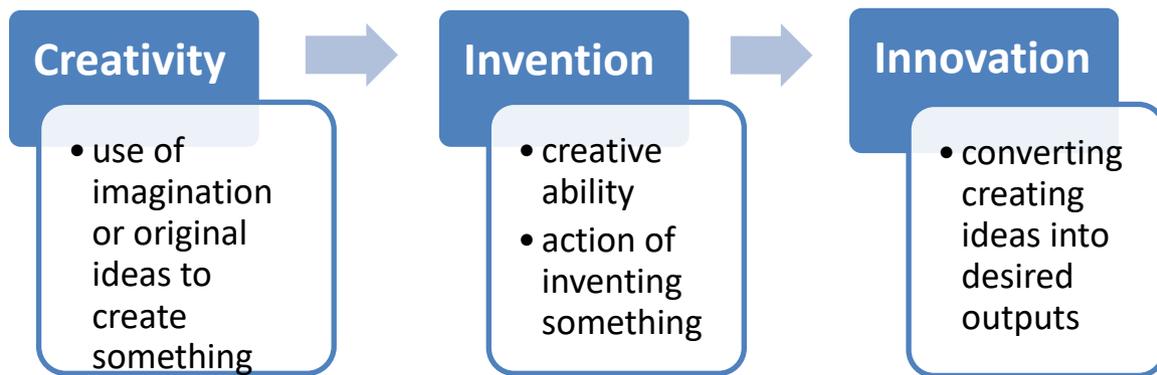


**Figure 1.** Features of creative minds.

Nowadays, in our dynamic and competitive world, designing a creative environment is a main goal and challenge for many companies, organizations as well as educational settings. But why creativity is so important? Generating ideas, solving problems, giving solutions that are novel and most of all useful, are a key element of invention and innovation. In other words, creativity is the first step of innovation. Innovation, however, is crucial in order to adapt to changing technologies, demands of companies, customers, to differentiate one firm from another. This is the reason why scientists and managers are trying to define optimal conditions for creativity, because creativity leads to development of innovation. Creativity, invention, and innovation are all interrelated and necessary for growth to occur. [6]

Next, a very important question that should be asked is where to look for creativity and innovation, which area of the community should be taken into account most. The answer is - education. Supporting creativity as well as innovation becomes a priority in the scientific and educational policy of most countries that call for innovative minds and processes to stimulate economic and scientific growth. While our knowledge-based society has adopted this view, supporting creativity is one of the main challenges faced by teachers and decision-makers. [7] Dynamic changes, both social and economic have lead to creation of need for development of innovative teaching as well as learning techniques that will facilitate their problem solving ability and mobilize creative potential of students. Creativity is currently one of the basic managerial competences. Over the last few decades, creativity has become a very fashionable subject in both the academic and business world.

This does not mean that creativity has not existed before, but its importance for the continued success of the organization has not yet been recognized. Many management issues require creative insights to find satisfying solutions. Nowadays, most organizations are fully aware of the importance of creativity for their well-being. Over time, considerable research has been undertaken to allow us to better understand creativity and become more innovative.



**Figure 2.** Definitions of Creativity, Invention and Innovation.

Research has shown that people can be easily taught, trained and encouraged to be more creative. Four creative skills can be distinguished and learned:

1. Fluency – which is simply the ability to create many ideas
2. Flexibility – the ability to create a variety of ideas
3. Elaboration – the ability to add details, depth, blends of perspectives
4. Originality - novelty, innovation, uniqueness

Fluency may be developed through creative thinking workshops in which ideas for different uses of everyday objects should be created.

Flexibility can be improved by exchanging different types of uses for everyday objects, and later moving on to work on similar challenges.

Elaboration may be developed by describing with significant details, using all physical senses. You can get to know the originality by choosing one common object and exchanging many new applications. Regular practice in each of the above activities may lead to the acquisition of improved creativity skills. [6]

Therefore, higher education should be focused on the integration of creativity and pedagogical practice. The world and reality are becoming more and more complicated, creativity, however, helps to solve difficult problems that we face. [3] Creativity and innovation are of course not a cure for all problems of the present world, they do not guarantee solutions to all issues. There is no doubt, however, that creative, innovative people are able to think, act and solve problems differently, come up with original ideas, improve existing solutions, refuse limitations. [8] Scientists admits that creativity is now a trendy topic in education and there are many suggestions to include creativity and innovation in students curricular. [9] This is also supported by the opinion that too many students are not prepared for the modern economy and challenges of our modern society as well as creative problem

solving. We need creative problem solving to fill the gaps in our basic education, where the emphasis is put on using our mind to store information instead of developing its strength to create new ideas and transform them into reality. Our productivity will be increased when we use our brain to challenge, invent, discover and create - in other words, employing creative thinking. Through creative problem solving, we generate new ideas and innovative solutions for a given need or problem. These ideas will be more efficient and often of much higher quality. Creative problem solving ensures the balance of our thinking, because it integrates analytical and imaginative ways of thinking. Intuitive and interpersonal ways of thinking are just as important as critical and organized thinking for the best results. Therefore, creative thinking skills are essential to help people accept and deal with change. [6]

One of the method that contributes to the increase of creativity and innovation level in education of various fields (art, medicine, technology) is the Project Based Learning method. [10] The aim of the study is to present and characterize creative methods in education based on the Project Based Learning method using the example of the Smart-Up Lab program organized by the consortium: Medical University in Lodz, Poland and EIT Health.

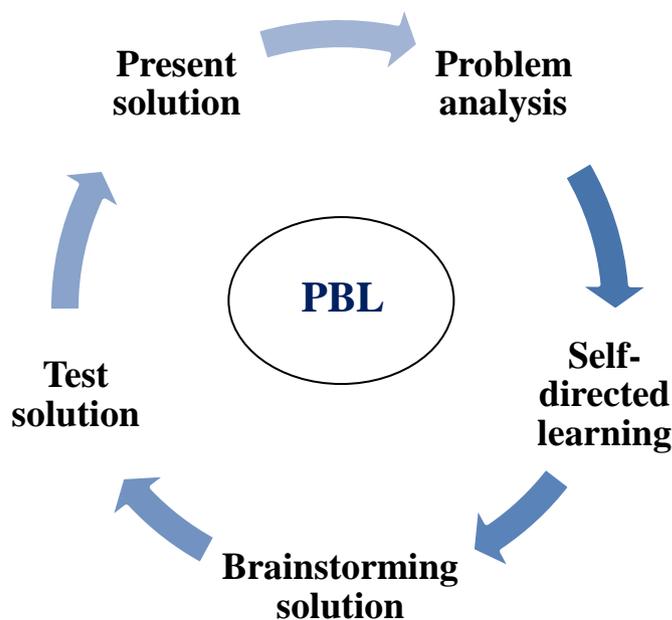
## **2. PROJECT BASED LEARNING AND CREATIVITY AS KEY FACTORS OF THE MODERN EDUCATION SYSTEM**

### **2. 1. Project Based Learning method**

Today's enterprises face huge competition in case of costs, quality as well as brand recognition. To meet all requirements, they expect a great creativity from their employees focused on developing innovation. It all makes education of the young generation (future employees) dedicated to people intended for creative work. Currently, one of the most popular methods introduced to academic environment is the Project Based Learning (PBL) method. The PBL method is successfully implemented into education of the creative class in order to build a creative society ready for creating innovations. [11] It includes people involved in: art, education, engineering, research and development, design and media. As it can be seen, it is an extremely diversified social group in terms of professionalism.

Therefore, it can be stated that a creative class is not built on the basis of professional identity or economic and material status but on their individualism, autonomy, belief in the high importance of competences and professionalism in social and economic life. Following extraordinary competences we can include: knowledge, the ability to think "out of the box", high communication skills for social purposes (building a network of professional connections) as well as in technology (using modern means of communication). [12] Project Based Learning is a method of didactic work in which students implement the undertaking on the basis of assumptions established with the lecturer. At the beginning, goals and methods of work are set, as well as deadlines for the implementation of the whole and subsequent phases. The criteria for the assessment of individual work stages are clearly defined. The project task is most often performed in a group, although students can also work individually. After the end of the project, the results of students' work are presented to the public. During the implementation of the project, the lecturer acts as a coordinator and consultant - helps in making decisions regarding the division of tasks, supervises deadlines and assesses student performance. [13]

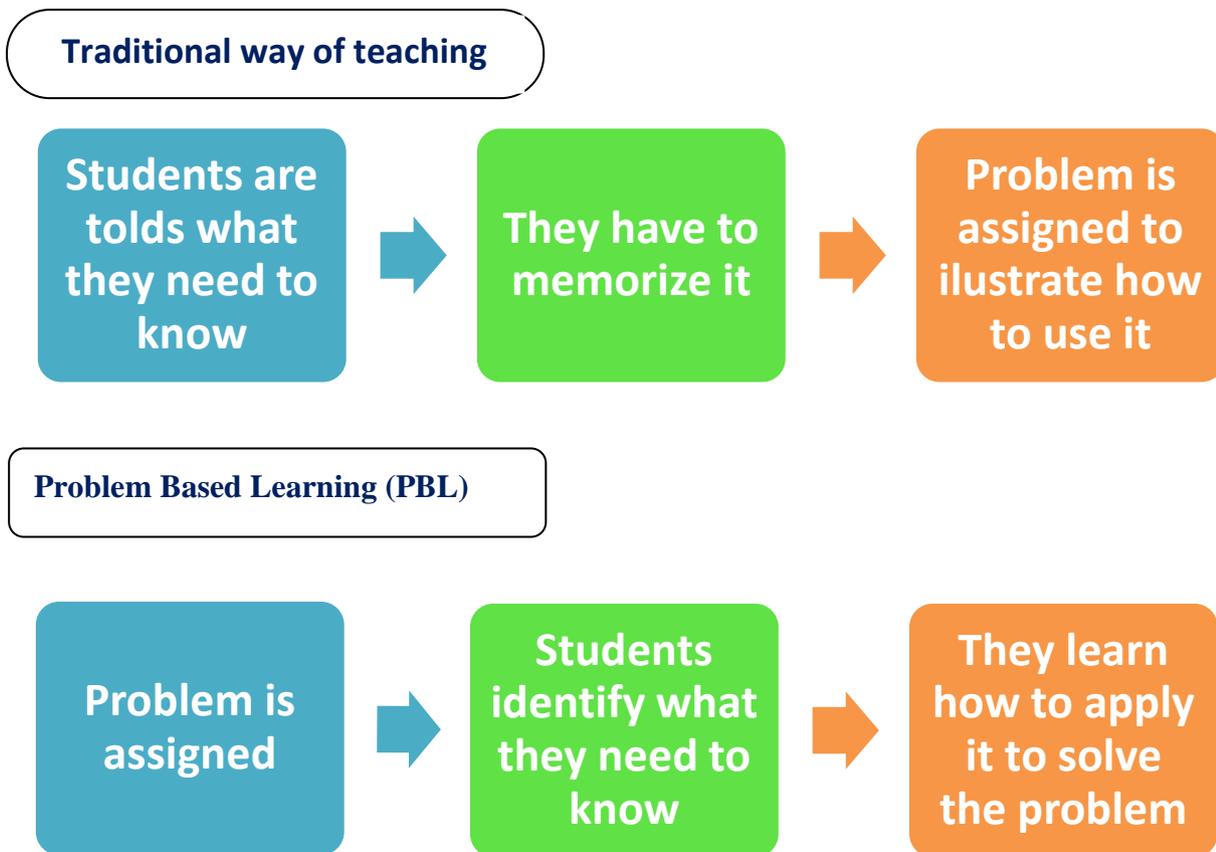
In the traditional way of education in most of the countries, the main scheme of teaching and learning can be defined as interactions between the student and the subject. This means that students learn individual thematic blocks by participating in lectures, exercises or laboratories. Usually, tasks are performed independently, without the possibility or need to cooperate in the group while solving it. [14] With the Project Based Learning method, interaction of student and subject is enriched by: team (Team Based Learning) [15] and project. These two elements are crucial for the proper development of students because it forced them to acquire practical skills related to team work and learn how to solve specific problems defined in the project, usually real-life problems. Project Based Learning assumes teaching by defining goals and developing skills: critical thinking, problem solving, collaboration, asking the right questions and self-organization. Students and teachers reflect on the effectiveness of activities, quality of work, obstacles and ways to overcome them. Students also receive from teachers and provide them with feedback to improve their results. Each completed project is presented to the public. [16]



**Figure 3.** Cycle of Project Based Learning method.

Project Based Learning can be also associated with another concept: Problem Based Learning - education through problem-solving, in which more emphasis is placed on the theoretical aspect. Often, these two concepts overlap with each other, which can be demonstrated by various definitions of the project method. This can be seen as confirmation of the fact that the PBL method requires students to take a number of actions and apply multiple thought operations in order to find a solution. Currently, the PBL method is introduced to many different institutions and universities such as: Alborg University (Denmark) with Master's studies in the field of Problem- and Project Based Learning, Massachusetts Institute of Technology - MIT (USA), which conducts workshops using the Project-Centered Learning method, Maastricht University (The Netherlands) - a university

well-known for the use of the Project Based Learning method, Queen Mary University of London - precursor of the PBL method in Great Britain [17]. Traditional education supported by the idea of Project Based Learning brings much better results than purely traditional education, not including creativity and project orientation of lectures. According to scientists, this is due to the increased commitment and independence of students in case of the PBL concept. [18]



**Figure 4.** Comparison of Traditional way of Teaching and Problem Based Learning

## 2. 2. The Smart-Up Lab project as an example of application of the Project Based Learning concept and introduction of innovation to education

One of the examples using the Project Based Learning method is the Smart-Up Lab project organized by the consortium of the Medical University in Lodz, Poland and EIT Health. The Smart-Up Lab (SUL) is an interdisciplinary school of innovation and entrepreneurship. It lasts 9 months and it is offered to students, PhD candidates and graduates of all faculties as well as young innovators and entrepreneurs.

During participation in the projects, students have the possibility to participate in over 90 hours of workshops concerning business creation, innovation, business plan writing, negotiations, pitching, marketing and law. As it can be seen, SUL focuses on gathering

different areas of knowledge important for the overall development of young innovators. Furthermore, candidates for the program come from various fields, which contributes to the interdisciplinary nature of created teams and projects. The key point of the program is to enable participants to start thinking “out of the box”, to use their creativity in developing innovative products, solutions, services and ideas. According to the Project Based Learning rules, students have to build up teams working together on real-life challenges thus developing their ability to work in a group, communication, sometimes leadership and conflict management. One of the most important features of the project is solving real-life challenges.

Each team needs to work on solutions of real problems introduced by external, industrial partners – usually companies, clinical centers etc. Working in groups, students need to examine what exactly the problem is, what its causes may be, and suggest a solution. It is interesting and stimulating at the same time, because the proposed tasks concern real problems that occur in companies, so students can contribute to solving real problems occurring in the largest corporations in the world. And what are the companies gaining? A fresh, innovative perspective of young people on the company's situation, which is often lacking in developed and successful companies. Students always have the opportunity to present their solutions to experts. It is also an important element of the Project Based Learning method - giving feedback.

In traditional teaching models very often too little attention is focused on giving feedback. The great part is to evaluate, assign degrees, check the degree of acquiring a given range of material in theory.

The Smart-Up Lab project checks how much we have learned in practice, by writing a real business plan of the project, by creating cards of observation useful for solving real-life challenges given by companies, by pitching ideas in front of experts, even by building real demonstrators and prototypes of their ideas and products. During the first edition of the project, which took place in 2017 as a result of the entire program, 9 teams were created that presented 9 innovative ideas for products and services in the field of IT, medicine, pharmacy, medical devices, etc.

**Table 1.** Characteristic of Smart-Up Lab project as an example of Project Based Learning method.

<b>Activities in Smart-Up Lab project</b>	<b>Description</b>
<b>Workshops</b>	Providing students with basic knowledge that will help them to identify problems. More than 90 hours of workshops: Introduction to innovation, Business Plan creation, Pitching, Negotiation, Marketing, Law, Economy, 3D Printing. Workshops – knowledge given by trainers is followed by self-directed learning.

<b>Team work</b>	Working in teams in order to solve problem recognized. Team work enables students to use creative method of management: brainstorming, Design Thinking, questionnaires.
<b>Real-life challenges</b>	Challenges provided by industrial partners. Their task is to familiarize students with real life challenges that will allow them to propose solutions for companies. Thanks to this, students will gain value in the form of life problems and the possibilities of solving them, while companies will gain a fresh look at the problems that appear in the company that can be solved in an innovative way.
<b>Prototyping</b>	Creation of a draft version of a product that allows students to explore their ideas and show the intention behind a feature or the overall design concept to users.
<b>Presentation of solutions</b>	Pitching Competition as part of solutions presentation is one of the main steps in Smart-Up Lab project and Project Based Learning. Students can present results of their problem analysis, brainstorming and prototyping.
<b>End product creation</b>	Students have also possibility to create product or service that they were developing during the whole project. Product or service is an answer/solution to the problem that was assigned at the beginning and which students analyzed.

Some of these ideas are currently in the incubation and commercialization phase. As you can see, this is a very promising result compared to traditional educational programs and studies, which focus only on the acquisition of knowledge by students and the assessment of the level of acquisition of this knowledge. In traditional teaching models, there is usually no

space for creating innovations, graduates are not prepared to smoothly enter the labor market and to become valuable employees. Programs based on the Project Based Learning method, such as the Smart-Up Lab, can contribute to the increase of the level of innovation, to better preparation of students for independent work, to the development of valuable advice, open to new employees and innovators.

It is also worth emphasizing that the survey carried out that at the end of the project indicated for 40 participants, 12 people rated the project (so using PBL method, creativity and innovation) and its usefulness in professional life very highly, and 28 people highly.

### **3. CONCLUSIONS**

In this article, creative methods of innovative education have been discussed. As already stated, creativity is the act of changing imaginative and new ideas into reality. It is represented by the ability to perceive the world in a different way, finding hidden patterns, creating links between seemingly unrelated phenomena and generating solutions. Creativity involves two processes: thinking and then production. [16] It has been also stated that creativity is not only about believing in new solutions and ideas to bring them into form, but also about generating them in the first place'. [17] Moreover, it is significant to introduce creativity into the education system in order to increase the level of innovation in schools, at universities, among future employees, and thus contribute to the growth of innovativeness of economies around the world. Nowadays, creativity is a substantial part of business education. Currently, up to 80% of entrepreneurial programs require introduction of some form of creativity training and innovative methods of teaching. Teaching future business men, health care practitioners, teachers, engineers how to think creatively is one of the most important agents in fostering innovation in different aspects of our economy. [18]

Entrepreneurial training based on the Project Based Learning method can serve as an incubator for innovation in different domains. Students may gain essential training as well as mentoring experiences. Schools, universities and programs have an excellent opportunity to increase their offers by using the PBL method and introducing creativity and innovation as main topics. A curriculum that focuses on developing new generations of innovators has the potential to enhance students' ambitions, facilitate the process of job seeking, support the development of more innovative economies. [19]

This is why, the Medical University in Lodz in cooperation with the EIT Health organization, has introduced the Smart-Up Lab project – interdisciplinary school of entrepreneurship aimed at young innovators. The Smart-Up Lab project was designed to increase divergent-thinking skills of students, to teach them how to think and work outside of the box and their comfort zone as well as how to approach real-life challenges. Non-traditionally, innovative strategies fostered a creative mindset, forced participants to use creative-thinking methods in order to solve problems. Due to the introduction of the Project Based Learning principles, the Smart-Up Lab has all the necessary features that innovative education projects should have.

The Project based learning method is one of the most effective teaching methods at the moment and we are currently observing the high intensity of its popularization in the didactic environment. [12] Although, according to many scientists and educators, creativity, innovative thinking, so the ability to think wider - “out of the box” is becoming more and

more critical to achieve success with students, PhD candidates and graduates in the market, “traditional” (student-subject) pedagogical approaches are still more dominant and in the existing frame of the curriculum there is a lack or a very small number of courses supporting creativity and innovation. [3] It can be concluded that the introduction into the curriculum projects such as the Smart-Up Lab may lead to the development of high-class specialists using creativity and innovative ideas in their everyday work.

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