

## The PBT/LM of Material Environment in the Urban Spaces

Jonas Jakaitis

*Department of Design and Institute of Architecture at Faculty of Architecture,  
Vilnius Gediminas Technical University (VGTU), Pylimo st. 26, LT-01132 Vilnius, Lithuania  
Telephone: +370 698 77781, E-mail: jonas.jakaitis@vgtu.lt*

**KEYWORDS** Anthropology. Human Being. Innovative Teaching Method. Material Environment Design

**ABSTRACT** The paper focuses on disclosing theoretical and practical problems of development of different urban space objects. The evolution of the user's knowledge about the application of the functional and aesthetic principles of harmony regarding the material environment is the main aspect of the qualitative formation of urban spaces and the main objective of the study. The paper discusses preconditions for harmony of the designed material environment applying the methods of *alternative, generalized and comparative analysis*. The problem-based learning method (PBT/LM) is analyzed to understand its peculiarities and applications. The tasks are to reveal practical applications of problem-based learning using a variety of concepts for developing urban structures on the macro level and creating a material environment design on a local level. The investigation shows that the problem-based teaching/learning method can be an effective and meaningful tool, which would help develop urban spatial structures and material environment design.

### INTRODUCTION

The would-be experts working in the fields of architecture, the formation of the material environment and engineering find important not only accumulating knowledge obtained within the processes of general teaching/learning but also developing practical skills in teamwork. Therefore, the global labor market finds the use of innovative teaching/learning methods for present higher education and studies as objective inevitability. The application of theoretical knowledge requires relating the obtained information with professional development and team teaching/learning. Thus, in the course of traditional studies, there is a need for extending them with the help of advanced teaching/learning methods. Traditional teaching/learning is frequently unrealistic, too much theoretical and poorly determines the development of a creative personality. The major part of what is learnt by the students does not seem personally important to them (Ramsden 1992; Bligh 1999). It turns to be clear that searching for new innovative teaching/learning methods that should assist

students in implementing meaningful, innovation-based teaching/learning is a fundamental target.

The PBT/LM as a main object of research can substantially help with striving for more meaningful teaching/learning in a field of art, aesthetic principles of harmony with respect to the material environment of the urban spaces' qualitative development.

In this context, the relevancy of the discussed problem is partly disclosed by the research conducted by the World Intellectual Property Organization, which demonstrates that tendencies towards the development, for example of Lithuanian higher education still do not indicate fast-growing innovations (Dutta et al. 2014). In fact, in the last century, Europe has been moving at a quicker pace. For the Lithuanian Republic and other countries of Europe, the rapid unroll of new technologies. The grounds of the factories are progressively being changed by creative communities, whose raw material is their skills to imagine and make innovations. According to Europe 2020 strategy, with over 400,000 professionally trained designers, Europe has internationally recognized capability and a leadership position in design.

According to the Global Innovation Index rankings, there are huge differences between countries in the field of innovations. For example, UK design innovations are ranked second in 2014, and Lithuanian 39<sup>th</sup>. Therefore, according to Global Innovation Index 2014, the gov-

---

*Address for correspondence:*

Dr. Jonas Jakaitis  
Department of Design at  
Faculty of Architecture,  
Vilnius Gediminas Technical University,  
Pylimo St. 26, LT-01132 Vilnius,  
Lithuania  
Telephone: +370 698 77781  
E-mail: jonas.jakaitis@vgtu.lt

ernment approved Lithuanian Innovation Strategy for problem solving in Lithuania, which includes the first macro-scale long-term planning document for the period 2010-2020 and consolidates goals for innovation development, pursued tasks and methods, including the advancement of teaching/learning techniques.

Hence, the contexts of innovative and meaningful teaching/learning in scientific literature have been discussed for approximately 50 years (Ramsden 1992; Fiell et al. 2003; Gray et al. 2015; Servant et al. 2015). Nevertheless, the experience of modern search for how to implement purposeful learning in the run of particular courses (for instance, in the cases of the complex forming of the design of industrial products, the material environment in urban spaces and public psychophysiological coexistence) is not particularly rich. Hence, a discourse, in terms of the concept of general educational values, still remains a burning issue these days, and the ideas of the PBT/LM formed at the historical stage of the technological and industrial revolution and interlaced with the values of morality, justice, and inherent rates (Jakaitis 2013) and based on the principles of the modernism of the 2<sup>nd</sup> half of the 20<sup>th</sup> century are inevitably meaningful.

## METHODOLOGICAL FUNDAMENTALS OF PROBLEM-BASED TEACHING/LEARNING

### Aspect of Creativity

The first half of the 20<sup>th</sup> century took an interest in sensual aesthetics, which resulted in the philosophical subjectivism-based paradigm of aesthetics and secular humanism. Everything sensual is real and measurable. Nevertheless, due to architecture and as the encounter of the calculable (as measurable level) and the incalculable (as immeasurable level) an architect of USA L.Khan felt that a great building as the material environment stuff starts with a conducting in the immeasurable (Lobell 2000). Measurable means are then used to construct it, and when it is finished, it provides access back to the authentic work in the incalculable (as immeasurable). Therefore, the quality of creativity, in both cases of figurative (as immeasurable) and practical activity (as measurable) remains unifying and the most important. Thus, when the arts became divided into figurative (as immeasurable) and applied (as measurable) (literature frequent-

ly refers as *mechanical* and *technical arts*, *art of machines* or *practical aesthetics* (Gaiūtis 2004)) ones, due to complexity and multi-functionality, these have been accepted the other way in the interactions between the present urban spaces and the material environment<sup>1</sup> design. Therefore, a need for changing a number of traditional provisions of the teaching/learning process arises. The PBT/LM is one of quite a few solutions to overcoming problems, with the help of which, the development of people skills is geared to deal with comprehensive systemic rather than single issues.

Maslow (1970) formulated an idea that the human being could not be taught, but only given assistance in how to creatively study. Thus, the ability to solve problems in an integrated manner, combining theoretical provisions and the development of practical skills, is one of a number of abilities that can be improved employing the PBT/LM. This mainly corresponds to the semantic meaning of creating the design of the material environment and spatial design in urban spaces, which enables the promotion of the wellbeing of the high quality material environment. The skill to overcome the encountered problems and to formulate ideas appears as the main task of problem-based learning, whereas the integration of the recently acquired information and creative innovations into the existing system of knowledge is the main target. Creativity, in the context of applying the PBT/LM, becomes the main teaching/learning incentive. The process of creativity includes not only designed products and the environment of their material wholeness, but also the development of the human being that uses these things and refers to them for finding a relationship with people and society (Jakaitis 2013). By the EU, for example, creativity is acknowledged as, “...that innovation, including design, (of products, processes and services), as well as culture-based creativity, are important tools for competitiveness and growth in order to improve the quality of life for the citizens of Europe” (Council of the European Union 2010). Various sources provide different definitions of creativity from the simplest one as the ability to create new things to the agreement, which was reached in Great Britain at the beginning of this decade, on interpreting creativity as ‘imagination-based activity aimed at producing original and valuable results’. For all that, the paper treats the concept

of creativity as the one formalized by the EU Member States and by legal acts of the Republic of Lithuania (for example, creativity is defined as a complex of personal qualities sufficient to achieve original, socially relevant, qualitatively new results of performance with the help of effective work, that is, the intellectual (mental), and social process embracing the discovery of new ideas and concepts or new relations and interactions between the established ideas and concepts (Government of the Republic of Lithuania 2010). Each person is creative in one or another sphere of interest and can learn to use his creative potential in a complex and rapidly changing conditions (EC 2009. Council Conclusions of May 12, 2009)<sup>2</sup>. It is clear that creative skills must be formed focusing on the consumer, who would be educated to understand and assess the specific criteria of urban space material environment. It turns to be clear that the development of creativity skills must take place on the basis of communication and knowledge exchange as well as on a holistic orientation towards dealing with the aesthetic, economic, technology or social coexistence issues of the material environment of urban spaces (EC 2012 Rethinking Education: Investing in skills for better socio-economic outcomes...), that is to create, according to Aristotle, the qualities of a homogeneous environment perfectly meeting the needs of the human being. Urban structures surrounded by the streets, path networks, other anthropogenic components and undeveloped urban spaces are treated from the point of “lifespan”. Their lifetime is sometimes much longer than the age of the spaces surrounding them. Thus, these can be attributed to the most important urban structures beneficial to creativity, because their shapes, color, ensemble, harmony make the largest impact on the population. The quality (conditions) of the material environment surrounding the human in urban spaces appears as the principal aim of human coexistence with the environment and as a condition for a positive psycho-physiological state.

#### **The Material Environment Design Methods: As Methods to Support to Problem-based Teaching/Learning (Design Heuristics and Functional Decomposition)**

The author extended existing the Problem-Based Teaching/Learning by other methods. In this study is introduced some methods related

to ideation ability such as *Functional Decomposition* (a method is commonly used in engineering) (Booth et al. 2014). However, when the products (as the material environment stuff of architecture, industrial product) are described in smaller items of functions, each function can be thought of as modular to some degree (Van Eyk 2011), and this *Functional Decomposition* gives insight into how a system functions. Where participants decomposed the functions within an existing set of concept, they generate and select a specific function and generate additional concepts using the *Design Heuristics* ideation method (Gray et al. 2015). *Design Heuristics* (an evidence-based method is for encouraging the production of varied concepts during idea generation (Yilmaz et al. 2011) related to Conscious Inspiration Method, also. The relevant methods can support architects and designers, as they actively and clearer set design constraints, and then use that constrained problem framing to create more innovative concepts. The expanded Problem-Based Teaching/Learning method to support the generation of ideas and help students obtain an understanding of the problem space. The method encourages the grouping of data to understand potential cohesion and interactions.

#### **Historical Background of Problem-based Teaching/Learning**

In the 15<sup>th</sup> century, figurative art, “lost contact” with handicraft, became a free art (Gaizutis 2004), and in the Renaissance, formed an independent artistic area. Under varying conditions, artist learning gained new tendencies. Artists studied at the schools and academies owned by famous artists but not in handicraft workshops. The representatives of *technical arts* understood the importance of handicraft as a reason for the prosperity of a number of arts. For example, architecture was derived from construction handicraft. Nevertheless, the progressive differentiation of these activities followed. This had an impact on the gradual replenishment of urban spaces with artworks as well as with the objects of a “good” handicraft and design. Architectural objects form spaces where artworks, as the objects of the material environment, have become the fundamental witnesses of the culture and identity of a certain period.

The rationalism of the enlightenment highlighted a particular meaning of the problems

concerning the moral issues, content and form of creation. The artist had to do a moral influence on people. At that time, morality and a sense of duty drove human behavior, whereas the prosperity of natural sciences affected the development of production. Rationalism is the basis for a relationship between beauty and truth. However, classicists such as R. Descartes' responses (Wardhaugh 2013) welcomed an idea of ignoring beauty, but still, appreciated it as an outcome of a direct relationship between the human being and the world and found objects beautiful only those acknowledged by the majority of people. This way, logic based criteria accepted and understood by the majority as well as by those required to be weighted must be considered (Boileau 1981). Thus, a statement of Aristotle that "...each object has a purpose or function" (Ozmon et al. 1996) provided a normative nature of the classicist's aesthetics. This is also a discussed issue of creating a modern material environment. Moreover, the integration of the form of an object results (aesthetics) in a classical concept of creative design. Thus, the form, purpose, useful and function shape a modern paradigm of designing the classical material environment. New arts streams of the 1<sup>st</sup> half of the 20<sup>th</sup> century attributed to modern art pursued keeping a distance from the concept of ancient art or classicism. The modern paradigm of phenomenology perceives the world through the personal body-affected senses permanently experienced through a relationship with the surrounding space and its objects appears as the most important in terms of the coexistence of the material environment as, according to M. Heidegger, one thing is discussing existence, whereas another catching it with the help of its entity. Hence, understanding phenomenology, according to Heidegger (1962), is only possible feeling it as a possibility.

Modern art, as an outcome of the movement of industrial aesthetics created a new society of artists and re-highlighted problems of a ratio of the utility of objects to beauty. Industrial and machine aesthetics penetrated into urban architecture and the design of the material environment. Logical thinking and entrenching standards became a part of everyday work on engineering artistic creativity. The tendencies that the creators of the material environment and art, along with their creativity, had to serve common good and beauty were prevailing (Ruskin 1989). The author supposes that control over artistic workshops that produce original products im-

portant to society, quality and the market is required, that is, in today's context of forming the aesthetics of the material environment, a system of criteria (as measurable) for beauty has been considered. Ch.W. Morris further developed the ideas of J. Ruskin, defined the idea of the pleasure of creating art and applied it to art as well as to physical activities that require intellectual powers of the human. He revived ancient handicrafts harmoniously linking architecture, interior design, furniture, utensils, carvings, metal works and stained glass thus forming a contemporary concept of modern design. On the other hand, architecture, urban spaces, objects of applied arts are distinguished due to the utilitarian purpose since they display immediate social value and are immeasurable and measurable. However, there are other opinions on the matter, that is, architecture as a spatial art form is very similar to the sculpture where no additional measures of decor are needed. Quite often the tectonics, structural elements, materials, serve a decorative role. "I'm not against the wall decorations", said the famous Brazilian architect O. Niemeyer. "Unfortunately, architecture often requires a simple and robust wall material, in these cases, sculpture, painting or any added art...only corrupts it" (Mitrofanov 1967).

The German Association of Craftsmen (WERKBUND)<sup>3</sup> promoted an ideology of the most famous architects, designers and engineers at that time and the principles of rationality, efficiency, versatility, integrity, complexity and teamwork characterized him. The basics of art synthesis and practice along with more conceptual shapes of the ideas of object coexistence were established. The objective was to combine the creativity of an artist and artisan's craftsmanship rather than to merge these two areas together. Striving for a technically and artistically integral result, to conduct activity, bringing together all powers of artists and craftsmen and introducing a distinctive training system for architecture and design was necessary. For urban spaces between house walls and appliances of the material environment concerning the development of internal communication, other knowledge and cognitive methods were required. An artistic phenomenon of designing industrial objects originated in *Bauhaus school*<sup>4</sup>. The buildings were decorated with industrially manufactured metal elements of high aesthetics. The designers representing *Bauhaus school* were the first to theoretically investigate and practically master the methodology for the aesthetics of



industrial products and to offer a new paradigm of teaching/learning. In the background of this environment, Johannes Itten notices that any presentation of his teaching seems to be dim compared to what actually happens at the time of close team communication with students (Rührberg and Ingo 2000). An 'anti-academic' *BAUHAUS* model of teaching/learning changed the essence of creativity. The creators of that time justified a practical understanding of an object, forming referring to the characteristic principles of space, the volume of contrast, the harmony of forms and understanding the wholeness (a theory of Gestalt psychology).

### **The Problem-based Teaching/Learning: Aspect of a Theory of Gestalt Psychology**

At the beginning of the 20<sup>th</sup> century, they had a powerful impact on the movement of *BAUHAUS*, *deSTIJL*, *VCHUTEMAS* aesthetics and influenced the evolution of the artistic perception of recent design in urban spaces. Ch. von Ehrenfels, one of the initiators of Gestalt theory, emphasized that the wholeness of the perceived image was not identical to the sum of elements (Ehrenfels 1937), and therefore it had to be understood in need of accepting human psychology that treated the environment as combining all perceptible subjects in a certain wholeness of objects unconsciously filled with the missing parts. Even today, this fundamental discovery of the school of Gestalt psychology acts as a specific tool for building a harmonious urban material environment to manage which appropriate teaching/learning methods must be developed. For this aim, human abilities to aggregate objects into certain forms and look at the material environment as at an object of integral perception are necessary. In this way, the aesthetic material wholeness of urban space stands as harmonious and complete. Such a harmony of forms and psycho-physiological comfort is not a cause of discomfort or social tension. The integrity of the urban material environment turns into a factor consolidating society, signs of cultural identity or the constituents of originality (Jakaitis 2013).

On the opposite, in spite of the definitions of Gestalt psychology and avoiding the evaluation of phenomenological psychology confirmation that world perception owns a three-dimensional character, urban spaces, the content

of the wholeness of the objects inside them and even the function will play a destructive role in society. On the basis of conducted research, urban spaces, *the clarity of the form of objects and the capture of their mutual coexistence* are the main criteria determining the psychophysiological comfort of the human being in a specific urban space.

Back to the new *Bauhaus* model of teaching/learning, the promotion of the idea generated in collective consciousness is a crucial issue. Creativity and motivation appear as the factors that go along with a successful application of the problem-based teaching, because the sectors of culture and creativity have large capacities in the EU and are supposed to be the areas of development. They can assist in striving for the introduction of the major EU initiatives (EC 2009). Challenges for EU support to innovation in services) and thus in the partial implementation of Europe 2020 Strategy. Hence, the present organization of creativity requires clear criteria for assessing the results of creativity. The indexes to evaluating the material environment supplemented by Besemer and Treffinger (1981) with the last two indicators suggested by an author are worth paying attention and deeper complex analysis in the future: *Novelty*: To what extent recent is the idea of the product and how much innovative are its concepts, performance technique?

How efficiently can this product lead to the emergence of other objects? *Synthesis*: How does the product put together separate elements into coherent wholeness? Is the product expressive, integral and aesthetic? *Functionality*: How effectively does the product correspond to utilitarian needs or help people with solving everyday problems? *Cost-effectiveness*: To what extent do the products of the material environment correspond to the optimized indexes to cost and benefit? *Ecology* of the material environment: To what extent do the objects of the material environment satisfy the principles of harmony with the natural environment and the adaptability properties of the life cycle? Thus, it is related to Europe's design strategic action (such as, European design on the global stage, Design in Europe's enterprises, Design in Europe's public sector, Design in Europe's innovation, research and education systems) as to the material environmental harmonization process (Design for Growth and Prosperity 2012). So, under

different ethnic cultures, new measures for sharing cultural resources and enjoying a high quality variety of the material environment of urban space can be found.

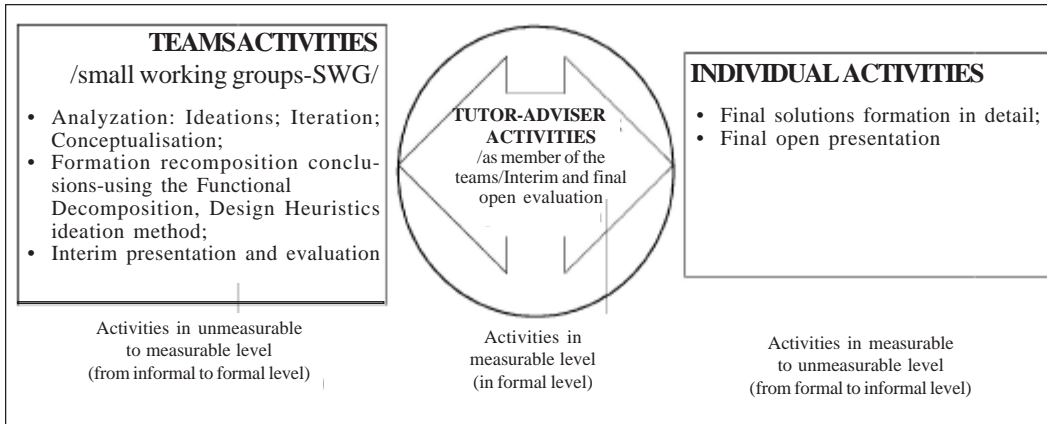
#### THE ANALYSES OF THE PROBLEM-BASED TEACHING/LEARNING

Presently, due to PBT/LM effectiveness, it has been developed in a number of countries and covered not only medicine in Canada (Barrows 1999). Recently in North America have traditionally been taught design thinking and processes using contemporary approaches to the theory of the PBT/LM, and usually within a local context (Poldma and Yacoub 2015). However, studies are developed on the interior design at the Vilnius Academy of Arts, at Šiauliai University, on industrial product and urban spatial design (Jakaitis 2012) at VGTU. Conducted research has revealed that examining real situations is a particularly useful method for resolving problems. *The Western world* presents this method of teaching as *Problem-based Service-learning*. *By integrating student creativity, the technique is attributed to setting real solutions to encountered problems*. The method allows students to *advance practical knowledge and offer real solutions to dealing with faced problems*. *The students resolving realistic problems have been noticed to further develop the sense of personal responsibility and become more obliged to put forward their suggestions*. *Otherwise, learning can be accepted as the area of activity having little to do with realistic issues* (Gordon 2009). This custom is a result of the inertia of the old regular system for studies, which, even nowadays, often motivates the student to collecting good marks. Nevertheless, according to the author's data in the course of research in 2014, about fifty-five percent of the students more and more oft consider the criterion for knowledge quality. Knowledge is the most promising interpretation of human being interaction and is created by the subjects within the process of action stimulating a discussion with each other. The PBT/LM introduced at the Faculty of Environmental Engineering of VGTU was mainly given full attention running the project *Update of Study Programs for a Sustainable Living Environment Applying Innovative Learning Methods, Strengthening Interdisciplinary Links and Implementing a Concept of Sustainable Development*. It was aimed at pre-

serving the harmony of the constituents of the usual and problem based learning relationship and dialectical interaction of these two techniques. In the context of the subject of the project, the author's book (Jakaitis 2012) mainly focuses on the adaptation of the innovative PBT/LM, the process of the complex urban and the material environment design and improvement in developing the industrial product design. Studying in *small working groups* (SWG) consisting of 3-5 students in the multi-environment permanently seeks to increase the abilities to integrally deal with challenges to making urban space more sustainability. Thus, a specific teaching/learning technique is formed with reference to the integrity of a number of individual components, including responsibility initiative, activeness, meaningful thinking, ability to think logically and leadership. The holistic approach is aimed at knowing the whole phenomenon and at considering not only the nature of the trained person but also the personal characteristics of the tutor-adviser.

Therefore, student involvement in discussions, personal contribution to investigating problems, the interpretation of identifying issues, the clarification of interaction phenomena, the ability of formulating ideas for solving problems and accepting leadership responsibility at the end of course become primary assessment criteria. It can be maintained that every stage of project development must be discussed at the intergroup (at least inter-SWG) level. Thus, facing the problems identified and raised by the students to the intergroup level must involve additional analytical work. According to investigation<sup>5</sup> conducted in 2010-2015, about ninety to ninety-five percent of the students find PBT/LM as an attractive tool. It easily identifies gaps in knowledge, discovers other previously hardly ever applied solving techniques for generating ideas as well as approaches the simulation of real situations and problem identification linked to the general wholeness of complex assertions. About ninety percent of the surveyed students say they heard about the PBT/LM information superficially, but thus are trained for the first time. This proves that the PBT/LM in Lithuania is still discussed in a limited manner and application is still very extensive.

According to the author, the discussed reasons that discourage from utilizing the PBT/LM in the system of higher education can be divid-



**Fig. 1. The PBT/LM is important for stimulating and directing a discussion in the right way. Example by VGTU: Teams activities; Tutor-adviser as member of interim and final open evaluation; Final solutions formation in detail by Individual activities (Model by J.Jakaitis)**

ed as follows: sketchy knowledge of the PBT/LM and mostly doubt about its benefits, lack of a political solution to implementing the PBT/LM in separate departments and the prevailing formal<sup>6</sup> approach to the application of the PBT/LM, additional efforts to organize the process of implementing the study program with the help of the PBT/LM are required, and the PBT/LM is an additional challenge to the young teachers in special. In this case, the enlargement of traditional teaching methods creates new creative variations and unplanned situations. Problems can be caused by the students themselves, as no one knows the final decision in advance. Combinations of objective and subjective factors affect solution and procedural sequences of participatory planning (Fig. 1). The application of the PBT/LM is important for stimulating and directing a discussion in the right way. Tutor's practical experience, weight and leadership qualities become very important factors in success. The PBT/LM is implemented through regular student and teacher contact sessions, gradual shifting from teacher-directed teaching/learning to student-directed learning/teaching. Thus, a student passive listener becomes a proactive actor, however, considering the condition that the student trusts in every member and leader of the team and SWG as well as in the teacher's authority. Only in this case, a student participating in the open, morality and justice-based educational process feels open to creativity. The execution of PBT/L assists in ensuring the quality of activity in the process of permanent (self)

assessment, which, in the case of employing the PBT/LM, is carried out by the participants of project preparation themselves. In this case, the feedback and communication culture and teaching/learning traditions are gradually formed. According to Barrows (1999), it is important to rely on the arranged PBT/LM variables directed to the student or teacher. Other variables are related to the real employment of the PBT/LM. The more real is the problem-based situation, the greater is the likelihood of creativity and motivation in the educational process, particularly in the cases of bachelor students when studies are focused on the student and partially on the student and teacher. A position when initiative is taken over by a tutor having a greater experience and competence can be defined as *creativity-supported interference* (CSI). In this case, the creative process is smoother, and the result is of better quality (Fig.1). This mixed implementation of the PBT/LM can be applied under exceptional circumstances, for example, running part-time studies. Application of the CSI principle provides students with more opportunities to partly make personal solutions and thus develop their skills. Still, in this case, the results of creativity still lack a systemic understanding of phenomena. Often, no conceptual decisions to implement underlying ideas and their alternatives are found.

Nevertheless, within part-time studies, when studying coincides with his/her work activity, the CSI principle is particularly effective in the

course of implementing the PBT/LM. Having supplemented the PBT/LM with the CSI principle, a possibility of integrating a *student-tutor* of a higher-cycle degree into educational activity arises, that is, the students of the second and third-cycle degree, as the leaders of the working sub-group, can replace the tutor within the first-cycle degree studies. In this case, all are winners and the implementation of the PBL/TM should become more 'student-focused', and the teacher should perform the function of the supervisor of meaningful training. A *student-tutor*, upon gaining new skills in training, should become even more motivated to continue self-studying and deepening personal knowledge and competencies. In this case, learning takes place not only when the student receives knowledge from the teachers but also interacting with the academic community must be considered. Thus, for teaching/learning, as for a creative knowledge formation process, conditions for active involvement in the professional environment proactively extending personal knowledge and practical skills must be created. The author proposes that an assessment structure within such a program through examinations could ensure the acquisition of a knowledge base while allowing the development of the cognitive creative process.

### DISCUSSION

The contexts of innovative, purposeful and meaningful learning in scientific literature have been discussed for approximately 50 years. For all that, the experience of modern search for how to implement meaningful, purposeful and creative teaching/learning in the run of courses (such as the material environmental design, urban architecture, in the cases of the complex shaping of the design of industrial products in urban spaces and social psycho-physiological coexistence) is not particularly rich. Therefore, a discourse, in terms of the concept of modern educational (ontology) still remains a burning issue these days.

The future wellbeing of society and the quality of the material environment largely depends on how humankind will learn to use economic, human reserves, knowledge and creativity to encourage innovation. Based on valuable and different cultures, one can find new ways to not only add value, but also to live together, to share resources and enjoy the diversity of the high-

quality urban space material environment. Urban areas, especially public areas, have no other purpose besides that which is intended to meet human communication, social, cultural or economic needs or functions. So is important to ensure the training (learning) in an aesthetic aspect of value recognition in the material environment, which would provide more harmonious human coexistence in urban areas.

In the context of new interfaces for creation, it could be an important discussion due to changing traditional provisions of the teaching/learning methods in the context of the quality of creativity related to interest intuitive, haptic and mind-controlled tools. It is an important aspect due to material environment design and objects as the meeting of the measurable (formal level) and the immeasurable (informal level). A great building or design objects, as the material environment starts with an implementation in the incalculable (as immeasurable) level. Calculable (as measurable) means are then exerted to build it, and when it is completed, it gives access back to the individual result in the incalculable (as immeasurable) as a common result of art. Therefore, for ensuring the harmonious coexistence of the material environment and society in urban spaces, the detection of tools to harmonize forms of the material environment, the aspect of applying innovative methods for teaching/learning goals becomes the most important issue.

### CONCLUSION

This investigation shows that the PBT/LM in the system of higher education can be divided as follows, that is, sketchy knowledge of the PBT/LM and mostly doubt about its benefits, lack of a political solution to implementing the PBT/LM in separate units and the prevailing formal approach to the application of the PBT/LM, additional efforts to organize the process of implementing the study program with the help of the PBT/LM are required, and the PBT/LM is an additional challenge to the young teachers in special. In this case, the enlargement of traditional teaching methods creates new creative variations and unplanned situations. Problems can be caused by the students themselves, as no one knows the final decision in advance. Combinations of objective and subjective factors affect solution and procedural sequences of participatory planning.



With reference to the variety of cultures of different countries, new methods for creating benefit as well as living together, sharing resources and enjoying the high-quality diversity of the material environment of urban space can be found. Many conditions determine different choices of problem-based learning methods, from a conscious discussion up to efficient involvement in the coexistence of real social interaction and a productive material environment. However, an innovative teaching/learning method such as the PBT/LM in Lithuania is still insufficiently applied.

According to research conducted in 2010-2015 (an investigation engaged more than 150 students as experts since 2010), about ninety to ninety-five percent of the surveyed students say they had heard only superficially about the PBT/LM and thus are trained for the first time. This shows that the PBT/LM application is still very limited, though traditional teaching/learning does not encourage students to meaningfully understand and actively participate in the process of studies.

Therefore, a need to change a number of traditional provisions of the teaching/learning methodologies. In this respect, special attention would be paid to encourage experiments, innovation and entrepreneurship in the material environment design, cultural and creative sectors, and in the field of innovations of teaching/learning processes. In addition, to further visions for new interfaces also should focus not only on the idea conceptualization in incalculable (as immeasurable) phase, but also on a realization calculable (as measurable) and on a result of esthetic in the context of "Social Ware".

In practice, the concept of traditional education has been expanded. PBT/LM is focused on closing gaps in traditional teaching and on replacing tutor-oriented teaching with student-oriented teaching. The PBT/LM method shows some similarities with contemporary techniques in individual and team research that take advantage of differential strengths in individual and groups creative processes, such as *the Problem-based Service-learning*, *functional decomposition* and *Design Heuristics* methods. Working out an idea for dealing with the problem is the most important aim. A debate on the approach of the academic society to the PBT/LM allows making a conclusion that a method together with other tools of education – functional decomposition. Design Heuristics can be a

meaningful and effective technique for shaping urban spatial structures and designing products of the material environment. Future wellbeing will largely depend on how humanity will learn to use economic, nature and human resources, knowledge and creativity so that to promote innovations.

The execution of PBT/LM assists in ensuring the quality of activity in the process of permanent (self) assessment, which in the case of employing the PBT/LM, is carried out by the participants of project preparation themselves. In this case, the feedback and communication culture and teaching/learning traditions are gradually formed.

### RECOMMENDATIONS

Research of the paper shows that the implementation method of Problem Based Learning/teaching (PBL/TM) could be useful as a pedagogical approach that focuses on those who take part in its processes to work both as supportive and encouraging change members working in cooperation with colleagues and teachers, and also as individuals to develop their creativity in finding novel solutions to practical issues in the field of material environment design. The process of questioning problems and finding new solutions using the creative spirit in informal level is also challenging for those who tutor and present PBL/TM based curriculum.

The study shows that the more real is the problem-based situation, the greater is the likelihood of creativity and motivation in the educational process, when studies are focused on the student and partially on the student and teacher. A position when initiative is taken over by a tutor having a greater experience and competence can be defined as *creativity-supported interference* (CSI). This study suggests show that the creative process is smoother, and the result is of better quality. This mixed implementation of the PBT/LM can be applied under exceptional circumstances, for example, the application of the CSI principle provides students with more opportunities to partly make personal solutions and thus develop their skills.

### NOTES

- 1 Material environment in this paper is perceived as the result of anthropogenic activities, for example, architecture as an object of the material environ-

- ment (Minkevičius 1988: 5), human household and home items, architectural landscape elements, and other features of aesthetic, economic, or social coexistence.
- 2 "Education and Training 2020", adopted by the Council in 2009, highlighted one aspects raising the requirements with emphasis on creativity, innovation and entrepreneurship at all educational and training levels. "Education and Training 2020" (ET 2020) is a new strategic framework for European cooperation in education and training that builds on its predecessor, the "Education and Training 2010" (ET 2010) work program. It provides common strategic objectives for Member States, including a set of principles for achieving these objectives, as well as common working methods with priority areas for each periodic work cycle. From <<http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:e f0016>> (Retrieved July 04, 2015).
  - 3 WERKBUND (since 1907) (eng. *German Association of Craftsmen*), the important organization of artists is influential in its attempts to inspire good design and craftsmanship for mass-produced goods and architecture. The Werkbund was composed of artists and architects who designed industrial, household products as well as practicing architecture. From <<http://www.britannica.com/topic/Deutscher-Werkbund>>(Retrieved July 28, 2015).
  - 4 German architect Walter Gropius (1883-1969) established the Bauhaus in 1919 in the city of Weimar. Its core objective was a radical concept. From to reimagine the material world to reflect the unity of all the arts: [http://www.metmuseum.org/toah/hd/bauh/hd\\_bauh.htm](http://www.metmuseum.org/toah/hd/bauh/hd_bauh.htm)>(Retrieved July 04, 2015)
  - 5 An investigation engaged more than 150 expert students since 2010. The results of the investigation are useful to wide academics, designers, artists, researchers, and to the material design policymakers or other members of interests' communities. Investigation data is used for varied practical projects and programs. For example, author is working as ambassador for the UK Design Council and as a participant of project "Design for Europe". From <<http://designforeurope.eu/people/jonas-jakaitis>>, <http://designforeurope.eu/people/ambassadors>>(Retrieved July 04, 2015).
  - 6 Formal level is activities according to rules of legislation. Informal level is as Intuitive Design.

## REFERENCES

- Barrows HS 1999. A taxonomy of problem-based learning methods. In: JA Rankin (Ed.): *Handbook on Problem-based Learning*. New York: Forbes.
- Besemer SP, Treffinger DJ 1981. Analysis of creative products: Review and synthesis. *Journal of Creative Behavior*, 15: 158-178.
- Bligh J 1999. *Problem-based Learning in Medicine*. New York: Forbes.
- Boileau N 1981. *Poezijos menas*. Vilnius: Vaga.
- Booth JW, Bhasin AK, Reid T, Ramani K 2014. Evaluating the Bottom-up Method for Functional Decomposition in Product Dissection Tasks. In: *Proceedings of the ASME 2014 Conference*, Buffalo, USA, 17-20 August.
- Council of the European Union 2010. *Conclusions on Creating an innovative Europe. 3016<sup>th</sup> Competitiveness Council Meeting* Brussel, May 26, 2010.
- Design for Growth & Prosperity 2012. In: Michael Thomson (Ed.): *Report and Recommendations of the European Design Leadership Board*. Helsinki, Unigrafia in Finland: DG Enterprise and Industry of the European Commission.
- Dutta S, Lanvin B, Wunsch SV 2014. *The Global Innovation Index 2014. The Human Factor in Innovation Editors*. Fontainebleau, Ithaca, and Geneva: Cornell University, INSEAD, and WIPO 2014.
- EC 2009. Council Conclusions of May 12, 2009 on a Strategic Framework for European Cooperation in Education and Training. *Official Journal C 119 of May 28, 2009*. Brussels: The Council of the European Union.
- EC 2009. Challenges for EU Support to Innovation in Services – Fostering New Markets and Jobs Through Innovation. *Commission Staff Working Paper SEC/2009/1195/FINAL 2009*, Brussels: Commission of the European Communities.
- EC 2012. Rethinking Education: Investing in skills for Better Socio-economic Outcomes. *COM (2012) 669 Final*, Strasbourg: European Commission.
- Fiell C, Fiell P 2003. *Design for the 21<sup>st</sup> Century*. Mosca: Astrel.
- Gaizutis A 2004. *Estetika tarp tobulumo ir mirties*. Vilnius: VDA Leidykla.
- Global Innovation Index Rankings. From <[http://www.wipo.int/edocs/pubdocs/en/economics/gii/gii\\_2014.pdf](http://www.wipo.int/edocs/pubdocs/en/economics/gii/gii_2014.pdf)> (Retrieved on 24 July 2015).
- Gordon M 2009. Toward a pragmatic discourse of constructivism: Reflections on lessons from practice. *Educational studies. Journal of the American Educational Studies Association*, 45(1): 39-58.
- Government of the Republic of Lithuania 2010. Resolution: Lithuanian Innovation Strategy for the Year 2010-2020. *Resolution No 163*, the Government of the Republic of Lithuania.
- Gray CM, Yilmaz S, Daly S, Seifert CM, Gonzalez R 2015. Supporting Idea Generation Through Functional Decomposition: An Alternative Framing for Design Heuristics. *Paper Presented in International Conference on Engineering Design (ICED)* in Milan, the Design Society, July 27 to 30, 2015.
- Gray CM, Yilmaz S, Daly S, Seifert CM, Gonzalez R 2015. What Problem Are We Solving? Encouraging IdeaGeneration and Effective Team Communication. *Paper presented in Third International Conference for Design Education Researchers in Helsinki Aalto University*, 1(4): 308-330.
- Heidegger M 1962. *Being and Time*. Translated from the German Sein und Zeit. 7<sup>th</sup> Edition. by John Macquarrie & Edward Robinson. Oxford: Blackwell Publishers Ltd.
- Jakaitis J 2013. *A Discourse on the Members of Urban Spatial Formation Under Conditions of Modern Democracy: Monograph*. Vilnius: Technika.
- Jakaitis J 2012. Study Program of Urban Engineering (612H27001), Complex Project 1: Schoolbook. VGTU: Department of Urban Engineering, 59. From <<http://moodle.vgtu.lt/course/info.php?id=166>> (Retrieved on 19 March 2015).
- Lobell J 2000. *Between Silence and Light: Spirit in the Architecture of Louis I. Kahn*. Boston & London: Shambhala Publications, Inc. Printed in Canada.

- Maslow A H 1970. *Motivation and Personality*. New York: Harper & Row.
- Minkevičius J 1988. *Lietuvos Architektūros Istorija I: Monografija*. Vilnius: Mokslas.
- Mitrofanov KM 1967. *Sovremennaja Monumental'no-dekorativnaja Keramika* (Russian). Leningrad, Moscow: Iskusstvo.
- Ozmon HA, Craver SM 1996. *Filosofiniai Ugdymo Pagrindai*. Vilnius: Leidybos Centras.
- Poldma TR, Yacoub C 2015. Humanitarian Design for Refugee Camps: Solutions in Crisis Situations. *Paper presented in 3<sup>rd</sup> International Conference for Design Education Researchers* in Chicago, IL, USA, June 28 to 30, 2015.
- Ramsden P 1992. *Learning to Teach in Higher Education*. London: Routledge.
- Ruhrberg K, Ingo WF 2000. *Art of the 20<sup>th</sup> Century*. Köln: Taschen.
- Ruskin J 1989. *The Seven Lamps of Architecture* (Paperback). UK: Dover Publications.
- Servant VFC, Noordzij G, Spierenburg EJ, Frens MA 2015. Thinking in possibilities: Unleashing cognitive creativity through assessment in a problem-based learning environment. *JPBLHE*, 3(1): 46-62.
- Van Eck D 2011. *Functional Decomposition: On Rationality and Incommensurability in Engineering*. PhD Thesis, Unpublished. Delft: Delft University of Technology.
- Von Ehrenfels Ch 1937. On Gestalt-Qualities. *Psychological Review*, 44: 521.
- Wardhaugh B 2013. *The "Compendium Musicc" of René Descartes: Early English Responses*. Belgium: Brepols Publishers.
- Yilmaz S, Seifert CM 2011. Creativity through design heuristics: A case study of expert product design. *Design Studies*, 32(4): 384-415.