International Journal of Engineering Education Vol. 37, No. 1, pp. 204–214, 2021
Printed in Great Britain

0949-149X/91 $3.00+0.00

New Methodology of Teaching a Smart City Concept: A Case Study*

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Building smart cities requires educational programs that would offer students an up-to-date knowledge to be gained by developing their practical skills and, especially, by means of solving "living" problems. This paper presents a newly developed methodology of teaching students through research and creation of solutions that can be immediately implemented. The authors describe the suggested teaching approach by presenting a case study in which the problems and solutions of a real city, Belgrade, are explored. Students developed an online survey with questions addressing the main problems in the city. The citizens' view of the problems in the city was the basic input for students in designing a new smart city concept. Compared to the traditionally trained group of students, the satisfaction with the teaching results of the newly trained 126 students divided in two groups, was higher.

Keywords: teaching methodology; education; smart city; practically oriented; survey

1. Introduction

We are witnessing a great expansion in the development of our surroundings that can be experienced on a daily basis. This can be best observed in the cities that attract people from rural areas in hope of better and more optimistic life. As a consequence of that transition, which is becoming ever faster, cities become riddled with all kinds of problems, such as: air pollution, waste pollution, scarcity of resources, hindered traffic, safety problems, etc.

In recent years, there is a new pattern of urban development brought about by the globalization process. The most common conceptualization is a 'smart city' evolved from the previously recognized concept of 'digital city'. In definitions of both concepts, information and communication technology (ICT) investments are considered the basic solutions for improving the quality of life in cities [1]. Building smart cities is based on citizens' involvement and on consideration of their needs, with the aim to visibly improve their quality of life. The consequence of all this is that smart city, "offers strategic principles aligned with the three main dimensions (technology, people, and institutions) of a smart city: integration of infrastructures and technology-mediated services, social learning for strengthening human infrastructure, and governance for institutional improvement and citizen engagement" [2, 3].

Developments in high technology facilitate life flow in big cities and finding solutions to the difficulties of globalization. These developments bring many changes that the cities have to come to terms with, and many new ideas and projects that have to be realized, so that the cities can adapt to those changes as early as possible. As mentioned, a group of such ideas is the "smart city concept" which, with the use of modern technology, aims at creating a good platform for the future and for a more comfortable life, and at fostering the well-being of citizens as much as possible. People educated adequately and timely are the milestones of the smart cities' design [4]. Some authors are tackling the problem of how to attract multidisciplinary experts to make cities smarter by means of education [5].

In the previous century, many new methodologies were introduced in education, all trying to attract students more than the others. Only few of them were successful in the classroom. Mostly, they were teacher-centric methods designed to be applied in conjunction with traditionally used teaching tools. This approach does not satisfy new generations of students that are moving rapidly up through digital age. To achieve efficiency in using classroom technologies, teachers turn to innovation-oriented teacher-student collaboration [6]. In such way, teaching ecosystem can skip to a higher level of knowledge acquisition. The main target of science education reforms in the world is to develop cognitive skills and higher order thinking for all members of educational system [7–10]. Students demand teaching that involves deployment of new technologies, most of them digital.

* Accepted 5 August 2020.

Many investigations and outcomes of educational systems in Europe confirm the opinion that the education in this region has been lagging behind, not making the changes happening elsewhere and happening fast. Changes in technological, economic, and scientific areas demand very quick transformation of educational systems and their brining closer to new states of the society. Educational systems in Europe are not satisfactory, first for young people and then for the society as a whole. In addition, professors as persons in charge of knowledge transfer cannot be content with the neglect of needs for changes in tutoring and in self-remodeling. Gaining knowledge through old-fashioned courses, through repeating out of date facts, without confronting real problems, and without working on existing, current cases, bring neither capitalization of the knowledge, nor critical thinking solutions [11]. Such an educational system does not allow for incorporation of the newest knowledge or the emerging new educational methodologies.

Appropriate education for future engineers, who will be involved in creating and maintaining smart cities, is a significant factor in smart city development. It should be based on the strength of educational system using innovative teaching methods, as an important apparatus that will shape quality experts who will implement the best smart cities concepts. Building smart cities requires educational programs that will offer graduates and, also, undergraduate students emerging knowledge gained through practical skills and, especially, through solving ''living'' problems.

The main problem that authors try to solve through their research is how to prepare graduate students to immediately start their career as ''ready to work''. The purpose of this study is firstly: to increase practical knowledge and satisfaction of students by using new teaching methodology, secondly: to define new methodology of teaching smart city engineering concepts that would involve citizens as main actors in the future implementation of it.

The authors present a newly developed methodology of teaching students through research and creation of solutions that can be immediately implemented in a system. Authors describe the suggested teaching procedure by showing a case study in which problems and solutions of a real city, in this case – Belgrade, are explored. Within this procedure, students developed an online survey with questions addressing main problems in the city created through brainstorming. The citizens' view of the problems in the city was basic input for students in designing a new smart city concept. Compared to traditionally trained group of students, the satisfaction with the teaching results of the newly trained 126 students divided in two groups, confirmed by calculating Pearson coefficient, was significantly positive. Authors proved that implemented combination of teaching tools is more effective for students and makes them more responsible and assertive.

2. Literature Review

Ethnographic surveys have been in use since the 1950s, ''Ethnographic research is a qualitative method that allows researchers to observe and interact with the participants of the study in their real-life environment'' [12]. The ''Design Theory & Methods Group'' has focused on solving all sorts of problems within design. This related also to teaching methods. One theorist was Herbert Simon who described relationship between problem-solving and human decision-making processes and their implications on social institutions [13]. Melvin Weber and Horst Rittel wrote against the earlier rationality present within the design methods. They marked planning and design problems as ''wicked problems'' which are immutable in relation to the techniques of science and engineering, which they have characterized as ''tame'' problems. This approach was a criticism focusing on design problem solving. It turns towards more user-oriented processes where designers include stakeholders (clients, customers, users, the community) in joint work process [14]. Such inquiry led to user-centered design – which is related to what the authors are presenting in this paper. An industrial designer, Henry Dreyfuss, developed systematic processes and methodologies based on human factors in design, Dreyfuss focuses on users and uses in his industrial design practice. He combines a strict approach to usability with user testing and a strong sensibility to aesthetic design [15]. John Dewey was a promoter of learning by doing – rather than classical type of learning by receiving knowledge, passively. He believed that each person is active and has potentials to explore. He encouraged learning through experience. His key points were how to apply the lessons and how to reach practical results [16].

Goal-based scenarios, introduced by Roger Schank, are a model of learning that combines case-based learning with learning by doing. Goal-based scenarios teach a set of steps that we need to take in order to accomplish desired goal. According to Schank, goal-based scenarios serve here as a means of achieving educational purposes by attempting to achieve a set of scenario goals which are more meaningful and motivating for learners. A recent study of goal-based scenarios

indicated that users of this method of learning will benefit from worked-examples, detailed positive or negative feedback and small-group discussions of open-ended questions. Yet these are mostly proven methods of guided cognitivist learning approaches which often contribute less to motivation but more to learning outcomes [17].

3. Methodology

The majority of the world population resides in urban areas that are emerging as key places of social networking and problem solving in this century [18–21]. When creating framework for living in the cities, experts should be very careful. Time of Covid-19 virus pandemic, which the mankind is facing, shows us that in spite of the wish to be together, people have to think about "how to exist isolated from each other". When trying to be smart we should be far-sighted and foresee even very risky situations in the society.

At the Faculty of Engineering Management in Belgrade, for lectures of the "Smart cities" course, a new methodology for effective teaching of students is devised creating and implementing any new technology in engineering. This was done on an example of designing smart city concepts. What is innovative here is the fact that everything was done on a real system, on something that students were very well acquainted with, that students lived with. Students were involved in solving current situation as if they were employed and working on a project assigned to them at their working places by the stakeholders. The additional novelty was applying Problem and Solution tree concepts, usually used in project management when designing a smart city framework.

The brainstorming that was carried out by students, resulted in a number of categories of city problems that were considered the gravest. Those urban problems were put as a list in a questionnaire where respondents were supposed to rank them. After the querying process had finished, students proposed creative projects for the new smart city platform of Belgrade, that dealt with the problems observed.

The teaching was based on a research of a problem that currently exists. It is based on combination of a project-oriented and experimentally-oriented research teaching.

Why project-oriented teaching? Filho et al., write in their paper about the role of project-oriented learning that problem-based learning supports the development of personal abilities [22]. Moesby is focusing only on sustainable development that, in this case, must be incorporated into a teaching process [23]. One of the means to foster problem-based learning is by using project-oriented learning, defined as a specific learning tool, by means of which, the aim of project-based learning can be achieved. Such a method can lead to improved skills. The set of abilities deriving from the project-based learning can improve employment prospects of graduate students [24].

Why experimentally-oriented research teaching? All experiments involve collecting observations as answers to questions or solution to problems. There are differences between research and teaching experiments. Classroom experiments are part of a class designed to help students study the course curriculum more effectively. The hypothesis to be tested is derived from textbooks or course materials. Research experiments could be carried out on an existing research subject and on a living system [25].

Authors used online survey to receive initial overview of an online community pattern. This methodology, named netnography is described by Robert Kozinets in his book: Netnography: Doing Ethnographic Research Online. It discerns patterns of larger scale [26]. This method conducts ethnography over the internet. It is designed to study communities online.

Activities of the research are divided into two main levels. The first one is related to defining main city problems, and the second one to proposing a new city concept. All these activities are divided into six groups as shown in Fig. 1.

Research was finished just before the disaster caused by SARS-CoV-2 virus and the resulted Problem tree demonstrated already existing fear that Belgrade citizens have: the problem of the increased pollution level in the city and showed its effects.

Level 1:

First level covers the process of constructing a Problem tree of the city. Four groups of activities that were finalized to create the Problem tree are presented in upper part of the Fig. 1.

Group 1: Theoretical part:

- Teaching the theory of new technologies related to creation of smart city concept: Internet of Things, big data, machine learning, open data, face recognition, cloud computing. . . *Performed by professors.*
- Teaching the theory how to engage citizens into creation of smart city concept. *Performed by professors.*
- Teaching the theory related to financial resources needed to create smart cities. *Performed by professors.*

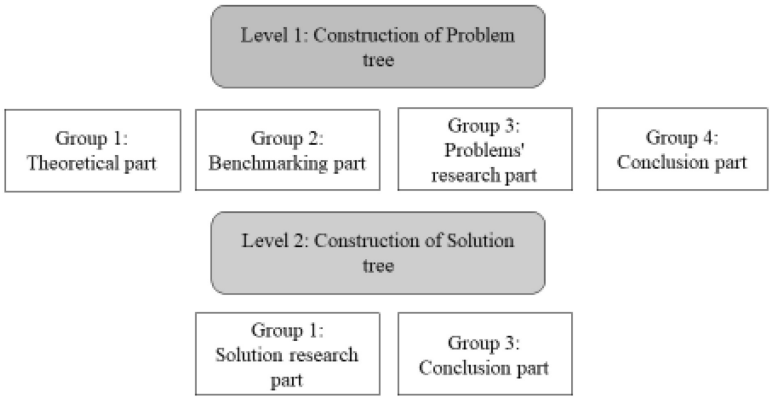

Fig. 1. Groups of activities.

Group 2: Benchmarking part:

- Best practice examples of using theoretical tools, such as: smart infrastructure, smart grid, green building, smart transport, video surveillance, 5G mobile network, broadband networks. *Performed by professors and by means of students' presentations.*
- Examples of smart city concepts and development strategies of various towns in Europe, Asia, USA. *Performed by means of students' presentations.*
- Examples of implemented smart cities projects and key project indicators of selected towns. *Performed by means of students' presentations.*

Group 3: Problems' research part:

- Creating a platform for development of smart city concept by defining essential problems of Belgrade. Using brainstorming technic. *Performed by students, led by professors.*
- Developing a survey on essential problems in the city. *Performed by students, led by professors.*
- Performing online survey on the problems in the city through social networks: Facebook, LinkedIn. *Performed by students, led by professors.*

Group 4: Conclusion part:

- Statistical analysis of the results. *Performed by students, led by professors.*
- Defining problems of the city of Belgrade that should be solved through a new smart city concept. Creation of a Problem tree. *Performed by students, led by professors.*

Theoretical Problem tree concept is shown in Fig. 2. It presents a hierarchy from the central cell which presents a specific problem or problems of the town, to the general problems that should enable long-term social impact. Specific problems are provoked by causes shown on the lowest level of the chart. The problem tree is a "window" into the analyst's mind. It shows if the thinking is chaotic or clear. There is a high correlation between the quality of the analysis and a problem tree. If the problem tree is clear enough, the outcome of the solution process will be well-structured. A messy problem tree is an introduction into a confused Solution tree with wrong outcomes throughout the study [27].

4. Implementation

Authors used SurveyMonkey (online survey software) application to collect answers from Belgrade citizens. The link was posted on social networks

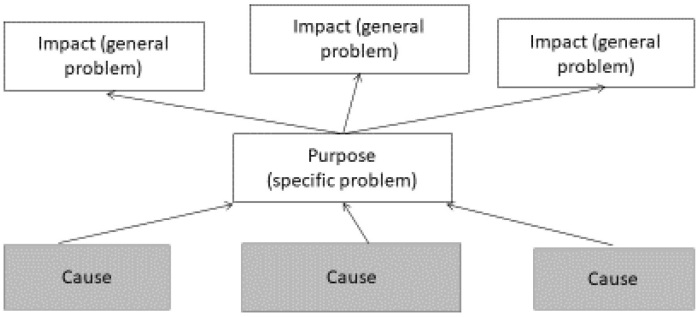

Fig. 2. Theoretical Problem tree.

Facebook and LinkedIn. The university and private connections were used for the survey. It was available for answers for three months. The mixed structure questionnaire was created with closed and open-ended types of questions. The interviews were not applied. The survey on Belgrade's problems included 45% female and 55% male respondents, while 56% of them were below 30 years of age.

Use of the presented methodology created a list of the most visible problem categories of the City of Belgrade. This list was subsequently used as a base for developing all segments of the smart city project, with needed financial resources and progress reports indicators. It is very important to note that the citizens have to be interactively included into all activities of concept development.

Level 2:

Level 2 is a process of constructing a Solution tree of the city. Two groups of activities are presented in the lower part of Fig. 1.

Group 1: The part of solution research:

- Creating solutions for Belgrade problems that would be implemented through the new smart city concept. *Performed by students, led by professors.*

Group 2: Conclusion part:

- Defining projects that should be implemented in Belgrade. *Performed by students, led by professors.*
- Defining Logical Framework Matrix (LFM) for the new Smart city concept. *Performed by students, led by professors.*
- Defining project indicators that should be implemented to monitor the improvement of Belgrade. *Performed by students, led by professors.*
- Defining financial instruments for the projects. *Performed by students, led by professors.*
- Defining tools for citizens' engagement into creation and realization. *Performed by students, led by professors.*

Theoretical Solution tree concept is shown in Fig. 3. It presents a hierarchy from the central cell which presents a specific goal or goals of the town, to the general goals that should enable long-term social impact. The specific goal will be reached by realization of the projects that will bring results shown on the bottom level of the chart.

The amount of data that should be analyzed in nowadays world is growing fast. It is more significant to extract useful knowledge from data that is already available than to collect endless data sets with countless data (doing big data mining) [28]. Solution tree is a useful classification technique. It is a structure that includes internal nodes that denote a test on an attribute. Branches denote the outcomes of a test. Every leaf node holds a class label. On the top of the tree, there is the root node [29]. Creation of the Solution tree requires logical thinking, skills of visualization, and spotting the level of problems and their branches [30].

A Solution tree can be transferred into a Logical Framework Matrix with its vertical logic, from the general goal, over specific goals all the way to the results expected from the activities-projects. This is a very good tool for clear understanding of the starting point of the concept development and the projects that should be realized. LFM was introduced as an analytical and management tool already in 1960s, when it was used for the first time for programs and projects; and later, it has gained popularity [31]. LFM is a useful tool but, as some authors say, it has advantages and disadvantages [32]. Two groups of main advantages are that LFM is improving and facilitating project design and implementation and facilitating its realization. Major disadvantage is vague planning without a time dimension, which gives the tool a static nature. The Logical Framework is a good approach to project design and management for mainstream planners, evaluators, and project managers [33]. Some authors write that "the simplistic conceptual structure of the matrix requires skilled handling to avoid pitfalls and produce acceptable approxima-

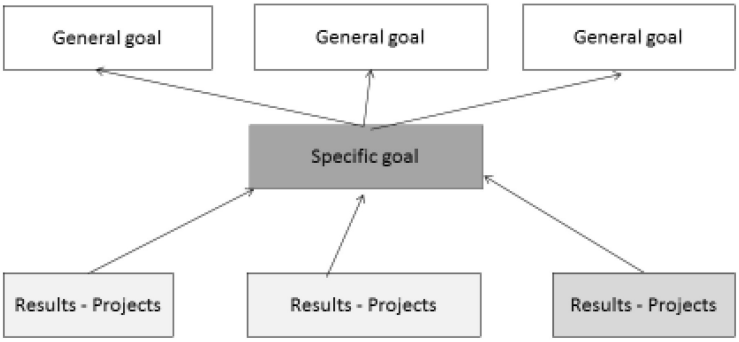

Fig. 3. Theoretical Solution tree.

tions or to know when not to employ it'' [34]. The applied LFM for the targeted projects in this article is presented in detail in the next section.

5. Results

The procedure and the results are described and discussed in the following paragraphs.

Through the process of brainstorming, the students have selected seven main categories of problems that the citizens of Belgrade have to live with. The problems were put in a questionnaire form where the respondents had to rank the gravity of each problem with marks from 1 (lowest gravity) to 7 (highest gravity). For one offered problem, only one mark could be selected. From 151 properly filled questionnaires only the highest-ranked problem was taken into consideration and counted. Table 1 presents the number of times each problem was ranked the highest. The questionnaire revealed that the biggest problem for Belgrade citizens was the pollution.

Fig. 4 presents distribution of opinions about the most important problems of the city. The survey participants highlighted pollution (air, noise, waste, water) as the main problem. Following the pollution seen as the biggest problem, the next in line are infrastructural problems and difficulties with the health system.

Table 1. The main problems of citizens of Belgrade

Categories of problems	How many times the problem was ranked highest
Pollution	43
Infrastructure	36
Health system	24
Culture	16
Employment	14
Digitalization	10
Education	8
Total	151

Problem tree developed specially for Belgrade is shown in Fig. 5. It is based on the theoretical Problem tree concept shown in Fig. 2, but in Fig. 5, it contains real specific problems, real general problems, and real causes. The main problems for people living in Belgrade are linked to:

1. Intensive migration of people with high education (brain drain).
2. Short life expectancy.
3. Increased level of stress.

The specific problem that causes them is defined as: Low quality of life in Belgrade.

Solution tree (Fig. 6) is created based on the Problem tree (Fig. 5) by changing negative expressions of all boxes into positive expressions for activities and results that should be done and obtained. This Solution tree is a customization of previously presented general concept from Fig. 3, but here it is presented with the real specific goal, real general goals, and real results that should be reached through implementation of the smart city concept in Belgrade.

From the Solution tree, an abbreviated Logical Framework Matrix is created, as presented in Table 2. This matrix contains a list of new activities/projects that should be completed in order to bring defined results. Some authors debate about using LFM because it reflects just the current state and cannot reflect dynamic changes, which are inevitable in an ever-changing environment. That is why researchers use LFM as a frozen reflection of the present moment. But any dynamic change will inevitably affect every aspect of LFM (input, processes, outputs, outcomes, and results-impacts). Some authors [35] merge logical framework approach, the traditional and widely used matrix, with a new results-based management (RBM) phi-

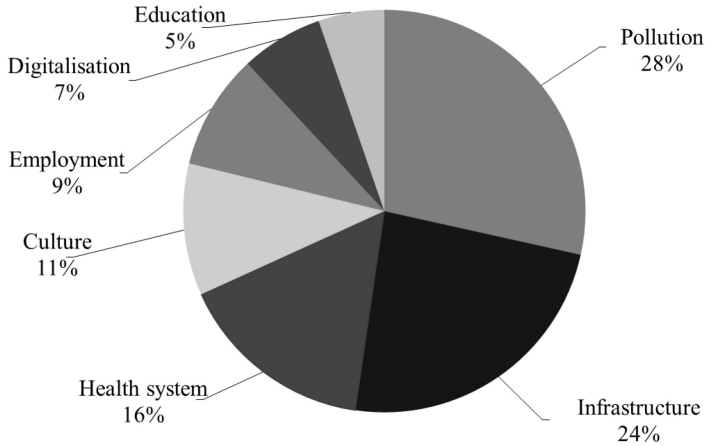

Fig. 4. Distribution of the most important problems in Belgrade.

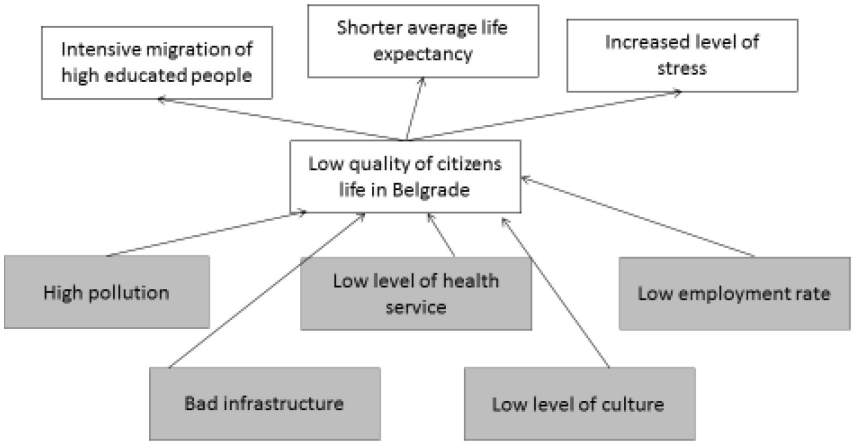

Fig. 5. Problem tree for Belgrade.

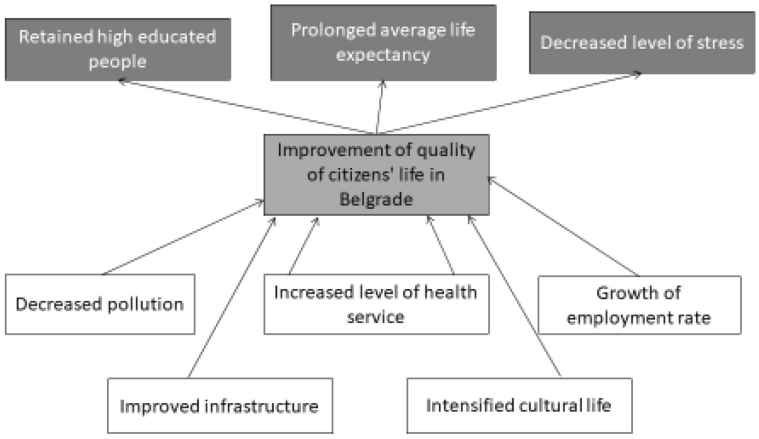

Fig. 6. Solution tree for Belgrade.

losophy changing fixed LFM into a results-based LFM. In that manner, they reach a dynamic management tool that can be applied throughout the whole project life cycle.

In this paper, authors created LFM as a stable starting point that must be dynamically changed through monitoring and evaluation processes [36–37]. LFM shown in Table 2 is shorter LFM than the one that is usually used; it doesn't have indicators, verification tools for indicators, assumptions, and risks. LFM ends with a row containing mentioned Activities/Projects proposed by the students. This row clearly shows what activities/projects should be undertaken in order to reach general and specific goals and reduce the effects of the problems that citizens selected as important.

Final step during the work was qualitative evaluation of students' satisfaction with the applied new teaching methodology. 126 students from the two study groups (all in the fourth year of studies) were questioned about effectiveness of the learning and 93.65% answered that they acquired more knowledge in this way, 3.9% said that the efficiency of learning was the same, and 2.45% were not satisfied. 95.2% felt more responsible after teaching was finished and 96.85% said that the new methodology increased their assertiveness. When compar-

Table 2. Logical Framework Matrix

General goals	1. Longer life expectancy 2. People with high education retained 3. Decreased level of stress
Specific goal	Improving life quality of Belgrade citizens
Expected results	1. Decreased pollution 2. Improved infrastructure 3. Increased level of health service 4. Intensified cultural life 5. Growth of employment rate
Activities – Projects	1. Green buildings, E-cars, Cars sharing 2. Smart streets, Smart traffic lights, E-pumps, Waste management-applications for purchasing waste food from restaurants, E-parking 3. Sensors for detection of accidents for elderly, Smart suits, Health services over mobile phones 4. E-culture platform for all events in the town, E-culture wallet 5. E-bureau

ing these two groups of students with each other, Pearson correlation coefficient is R = +0.92 and shows a significant positive correlation between them. When calculating Pearson correlation coefficient between these two groups of students with another one from the same year of study, which was taught using classic ex-cathedra method, Pearson correlation coefficients are R = +0.27 and R = +0.22 and there is no significant correlation between answers about qualitative satisfaction with the implemented teaching method. Similar case is one other control group where correlation coefficients are R = +0.33 and R = +0.30.

6. Discussions

Authors expect that this article has impact on decisions about methodology and tools in educational ecosystem in view of preparing students to work on smart city problems. In today's relevant literature, there are many more papers about education *in* smart cities than about education *on* smart cities design. When analyzing educational technology survey of Deloitte, it can be seen that in-classroom curriculum, thanks to new technology, is moving toward students' homes [38]. There is a growing interest by teachers, students, and parents to expand educational ecosystem towards the outside world. Some authors write about benefits of combining practice and experimentation, but they also see limitations in evaluation of involvement of each team member and correlation between assessment of students theoretical and practical work. For sure, such teaching makes the course curriculum much more attractive for students; they enjoy project-oriented work and work harder [39].

The smart education model proposed by some authors is oriented towards openness to the business and labor world. They say: ''we bring managers into universities, to teach students about working hands-on within a company''. Their educational system is based on the principles of gamification and they discuss about this model that enables students to enter the world of work [6].

Also, the research [40] shows that professors found that the use of case studies help students learn and process course content in a better way.

In the research of Yadav at all. [41] results suggested that the majority of participants felt more engaged and more realistic with the implementation of case studies in the class. Nevertheless, they concluded that significant differences between traditional lecturing and the use of case teaching method was not proved in students' conceptual understanding.

Unlike three previous references, in this paper, authors stress that, without examples from the real world and without including students in live cases during the lessons, learning is not sufficiently effective. This is different from experimental work, experiments are performed under artificial conditions while, in this paper, authors present one ''living'' case study. Students expect knowledge from teachers and this is why education staff should change the way of teaching towards involving the students into very quickly solving problems of the society. Teacher should have working experience from the outside world, outside of the educational system. Only then, they will easily be able to transfer scientific and experimental, or better said, theoretical and practical knowledge to the students. Educators must have references in implemented projects related to the subject they are teaching. New generations of students request learning linked with excitement, which increases level of adrenaline. In the article by Jay Gilbert, [42] she says that organizations have engaged workforce without taking into consideration any generation sensitive policies for their employees. Having in mind that the millennial generation (known as Gen-Y, born from 1982–2000) is slowly replacing baby boomers, it is clear that professionals will need to involve different engagement models taking into account big differences between the generations. Young generations are overrun by technologies. Millennials use them to express themselves, while generation Z does not accept theory-based, unidirectional teaching methods. Thus, it is not advisable for universities just to passively watch the universal changes [43]. This means, of course, that educational system has to recognize changes among generations and this should result in differentiation of teaching methods. Teaching aligned with demands of changing surroundings and future professions is inevitable. The necessity to involve students into upcoming technologies is confirmed in the presented qualitative assessment of students' satisfaction with implemented new methodology. Results of the questionnaire responses from 126 students about effectiveness of learning show that 93.65% examinees think that they acquired more knowledge in this new way.

This is in line with authors, Muhamad Hugerat and Naji Kortam [44] who presented a study on students' ability to derive conclusions from controlled experiments. They also researched how students can plan a controlled experiment. They found that students have a positive emotional attitude towards teaching and learning interventions such as case studies. In the feedback conversation with the students at the end of a new kind of course, they said that the development of critical thinking was relevant to the applied teaching-learning approaches based on experiment.

The key terms in the authors' teaching methods are "human factors" and "user-centered design." The design of any city, including smart cities, requires increased understanding of the qualitative factors in urban living, what the authors are calling "quality of life factors." How do engineers measure such qualitative elements, such as residents' well-being? In this paper authors use two innovative methods: [a] project-based learning and [b] online ethnography or netnography. The first one is a very fashionable method in a globalized society that pretends to solve all problems through projects. The second one is a method usually applied in the social sciences such as ethnography in the form of survey. This inter-disciplinary aspect is important to teaching urban design in general and smart cities specifically. Engagement of citizens (or users) and their feedback allows for new unexpected solutions to arise that professionals might have missed.

The limitation of the presented work are small groups of students that were tested. The tests should be repeated and done after each course. Students should be involved in giving their ideas for improvement of the methodology together with professors. The same is with the citizens. They should be permanently involved in creation of wellbeing engineering concepts. The group that was included in this research was reached mostly by using students' connections and this is an important limitation of the research. Larger scale pattern should be used, covering all ages, genders, income, and education categories. The differences between cities can be investigated by selecting various levels of towns' socio-economic development, cultural habits, nationalities. The attitudes of citizens towards this type of their engagement should be researched and ways should be found to elicit their response about urban problems and creating right solutions.

7. Conclusions

The problem defined by authors was analyzed by creating a new approach to teaching methodology. The methodology was created together with students and it resulted in using students' ideas, doing survey on a real study object and making joint conclusions on an engineering problem. The authors tried to reach the purpose of their research and to direct students away from only profit-driven towards human-driven approach to problem solving in engineering. This reflects the need of future engineers to have in mind, besides managers' objectives, also social scientists' perspective of a problem. People-focused engineering concepts must be discussed to improve wellbeing of people and sustainability of the society (especially ecologically driven). Not only high society groups, world leaders, and the richest should shape the world. Their position and amount of wealth distorts the picture of reality. They are not able to trace the way to the path of a happy future.

The goal of authors to increase satisfaction of students by learning was proved through qualitative evaluation of students' satisfaction. The analysis of their answers in relation to carried out investigation showed high level of satisfaction, increase in learning efficiency, and their assertiveness. The groups that were taught with the new methodology gave correlated answers about their impressions during work process.

Further actions after completion of this survey, based on using real-world methodology, could be repeated in a wide variety of fields such as making business plans, pitching new ideas, establishing students' start-ups, etc. . . In doing so, younger students could have their practical work and learn through it. This would be a good pillar of the educational system aiming at economy growth and a real link between education outcomes and the outside world and an entrance into it. Further research could be done by testing and analyzing how using the suggested teaching methodology in all mentioned future actions, all the way to establishing students' start-up companies, satisfies labor markets and how it attracts students to faster learning by means of problem solving and decision-making. All these could be adjusted to fit the actions that are previously mentioned.

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