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International Journal of Cognitive Research in Science, Engineering and Education

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EDITORIAL

International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE) is an open access international peer reviewed multidisciplinary journal that publishes professional, scientific and review papers in the field of humanities, pedagogical sciences, psychology, IT, mathematics and other sciences. Editorial Board strives to provide a possibility for the scientists of different fields to publish the results of their research, technical and theoretical studies. IJCRSEE is multidisciplinary in approach, and will publish a great range of papers: reports of qualitative case studies, quantitative experiments and surveys, mixed method studies, action researches, meta-analyses, discussions of conceptual and methodological issues, etc. IJCRSEE publisher is The Association for the Development of Science, Engineering and Education from Serbia and copublisher is College for Preschool Teachers, Aleksinac, Serbia.

The journal publishes articles in all areas of cognitive science, including studies of cognitive processes, emotions, perception, memory processes, thinking, problem solving, planning, training, studies of language and consciousness. The journal focuses on studies in the field of education, human performance and studies of fundamental cognitive skills in everyday life. The journal combines works in the field of psychology, artificial intelligence, linguistics, philosophy, computer science and neuroscience. The articles on the results of scientific research in various fields of cognitive science that concentrate on multidisciplinary audience are of top priority for the journal. The audience of our journal – is, in the first place, researchers in the field of cognitive science and related fields, including psychologists, educational researchers, anthropologists, philosophers, linguists, neuroscientists, programmers.

IJCRSEE has regular sections: Original Research, Review Articles, Studies and articles, Book Reviews, Case Studies, and is published twice a year. This journal provides an immediate open access to its contents, which makes research results available to the public based on the global exchange of knowledge. The journal also offers access to uncorrected and corrected proofs of articles before they are published.

The primary **aim** of IJCRSEE is to provide relevant scientific results for novice and expert scholars and to enable researchers to publish and share their work with the academe throughout the world. The aim of the journal is to promote and strengthen the quality of research in the field of science, engineering and education.

The **scope** of IJCRSEE is deliberately broad in terms of both topics covered and disciplinary perspective:

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- Cognitive Research in Education
- Cognitive Pedagogics
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- Psycholinguistics
- Cognitive Linguistics
- Cognitive Culture Studies

- Cognitive Geography
- Cognitive Neurophysiology
- Cognitive Aspects of Biology, Physiology, Neurophysiology
- Cognitive Aspects of Sociology, Political Science
- Cognitive Problems of Economics and Management
- Cognitive Aspects: Sport Culture
- Cognitive Aspects: Methodology of Knowledge
- Text Processing and Cognitive Technologies
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Each submitted manuscript is evaluated on the following basis: the originality of its contribution to the field of scholarly publishing, the soundness of its theory and methodology, the coherence of its analysis, its availability to readers (grammar and style). Normal turn-around time for the evaluation of manuscripts is one to two months from the date of receipt.

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The submission has not been previously published or presented to another journal for consideration (or an explanation has been provided in Comments to the Editor).

The submission file is in OpenOffice, Microsoft Word, RTF, or WordPerfect document file format.

Where available, URLs for the references have been provided.

The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.

The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines, which can be found in the section ***About the Journal***.

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A manuscript goes through the peer review process. Authors submit manuscripts to **Editorial office** via the online system. The acknowledgement letter should be sent to the author to confirm the receipt of the manuscript. The Chief Editor first reviews manuscripts. Chief Editor is assisted by Section Editors (could also be Co- or Associated Editors). The Editor assigns a Section Editor to see the manuscript through the complete review process and return it with a recommendation or decision. The manuscript is checked to see if it meets the scope of the Journal and its formal requirements. If it is incorrect or unsuitable, the author should be informed and the manuscript filed (or returned if requested) – direct rejection. Manuscripts that are not suitable for publication in the Journal are rejected. A Rejection letter is sent to the author stating the reason for rejection. If the manuscript conforms to the aims and scope of the Journal, and formally abides by the Instructions to Authors it is sent out for review. Depending on the type of paper, it could be accepted immediately for publication (invited Editorial, Book review etc) by the Chief Editor.

Check that the manuscript has been written and styled in accordance with the Journal style; that it carries an abstract (if applicable), keywords, correct reference system etc. and check that the correct blinding system has been used. If anything is missing ask the author to complete it before the manuscript is sent out for review.

The manuscript is sent out for review. The reviewer reads and evaluates the manuscript and eventually sends a review report to the Chief Editor. The time for review can be set to 2-6 weeks depending on the discipline (more time is usually given to papers in the humanities and social sciences). Make sure to provide the reviewer with clear instructions for the work, e.g. outlined in the form of a Review report or a number of questions to be considered.

Based on the reviewers' comments the Chief Editor makes a decision to:

- Accept the manuscript without further revision
- Accept after revision
- Ask authors to resubmit
- Reject

An acceptance letter is sent to the author and the final manuscript is forwarded to production. Sometimes, the authors are requested to revise in accordance with reviewers' comments and submit the updated version or their manuscript to the Chief Editor. The time for review can be set to 2-8 weeks depending on the discipline and type of additional data, information or argument required. The authors are requested to make substantial revisions to their manuscripts and resubmit for a new evaluation. A rejection letter is sent to the author and the manuscript is archived. Reviewers might be informed about the decision.

After review a manuscript goes to the Copy Editor who will correct the manuscript concerning the correct referencing system, confirmation with the journal style and layout. When Copy Editor finishes his/her work they send manuscripts to the Layout editor.

Layout Editor is responsible for structuring the original manuscript, including figures and tables, into an article, activating necessary links and preparing the manuscript in the various formats, in our case PDF and HTML format. When Layout Editor finishes his/her job they send manuscripts to Proof Editor.

Proof Editor confirms that the manuscript has gone through all the stages and can be published.

This issue has 15 articles (13 original research, 1 case study and 1 studies and article). Our future plan is to increase the number of quality research papers from all fields of science,

engineering and education. The editors seek to publish articles from a wide variety of academic disciplines and substantive fields; they are looking forward to substantial improvement of educational processes and outcomes.

Editor in Chief
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CURRENT SITUATION OF CIVIL AWARENESS OF UNDERGRADUATE AND PROMOTION STRATEGY RESEARCH

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ABSTRACT

We conducted on a questionnaire survey for the current college students' civic awareness from four aspects of equality consciousness, national consciousness, freedom consciousness and public consciousness. Survey data was analyzed with the SAS® statistical software, the results shown that some of our country's College Students with a strong national consciousness, and their patriotic feeling is deep at present. They identity the consciousness of equality, but their awareness of fighting for rights is not strong. They have a sense of freedom, but some students are not clear about the relationship between freedom and law. Their enthusiasm to participate in public affairs is not high. Their awareness of social morality is not comprehensive. The reason is that the influence of traditional culture and the political development can't keep up with the development of economy and the systematic citizenship education is lacked. Finally, we put forward a method of improve the civic awareness of Contemporary College Students in this paper.

1. INTRODUCTION

In 1978, the comrade Deng Xiaoping put forward the reform and opening-up policy. The reform and opening-up policy is the key choice to decide the fate of China in the future. It is the only way to develop the socialism with Chinese characteristics and to realize the great rejuvenation of the Chinese nation. With 30 years of economic development, GDP in 1978 was 2,168 hundred million dollars, in 1993 broke $5,000 hundred million dollars, and in 1998 broke $10,000 hundred million dollars. In 2009, China's GDP broke 50,000 hundred million dollars with $50,597 hundred million dollars. In 2010, it surpassed Japan and became the second economic entity in the world. In 2014, it broke 10 trillion with $103,611 hundred million dollars (China GDP Report. 2015). China's investment in education was also growing. In 1995, the number of teachers in China was 3,334,200. In 2013, the number of teachers in China was 5,099,000 people. In 2008, there were 2,263 colleges and universities in China and the number reached 2,529 in 2014. In 2008, the direct public expenditure of public educational institutions in China was accounted for 3.3% of GDP and it reached 4% in 2012 (National Data Report. 2015). Compared with the speed of economic development, the investment of education was still low, but the overall trend was better than before. It indicated that China economy and education had gained the rapid development over the past 30 years and achieved fruitful results. But the development of civic awareness was fell behind the economy development. To improve the citizen consciousness of the College students, it was necessary to make a thorough research on the domestic citizen's consciousness of present situation and built up

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a method to improve college students' citizen consciousness.

With the rapid development of our country socialist market economy, the construction of democracy, the rule of law, the development of modern civilization and the College Students' civic awareness education all had achieved a considerable development. The College students are the backbone of building a modernized country. To strengthen civic awareness education of college students, it need cultivate qualified citizens to meet the development of the socialist market economy and need build a socialist country with law. And it is also an important task for the Ideological and Political Education in Colleges and universities (Xie, 2009). Firstly, this paper explained the basic concepts of civic consciousness; secondly, it analyzed the current situation of College Students' civic consciousness; lastly, it putted forward the methods and strategies to improve the civic awareness of contemporary college students. This paper provided the necessary theory basic and method for cultivating the students to be the qualified citizens with loving their motherland, loving socialism, having correct concept of right and obligation, having spirit of innovative and subject consciousness.

2. MATERIALS AND METHOD

2.1 Citizenship and its connotations

The concept of "citizenship" was formed early in ancient Greece and Rome, and the city had already appeared civic role (Marx, Engels, 1957). At that time, the concept of citizenship was essentially unequal social classes (Marx, Engels, 1995). In Roman times, only a small number of people could become citizens, citizenship was not general enough. Middle Ages was impossible to develop a good civic awareness. 17th and 18th century, the Enlightenment made people to be aware more deeply of the "democracy, freedom and equality" than before (Mao, 1991).

Since 1970s, the concept of civil society has been mentioned again and has just started to be used by some western people to criticize the real society and to introduce the ideal society. In period of the late 1980s to the early 1990s, because Eastern Europe and Soviet Union had happened huge changes, the study of Western civil society formed an unprecedented boom. After the 1990s, the theory of civil society began to spread from the West and the Soviet Union to other countries and regions in the world and was used to explore the construction of its own civil society.

Citizen consciousness is the self-recognition of individual citizens in the country. The basic rights and duties is the base for citizens. The constitution and the law are the core content for citizen consciousness, which reflect their dominant position in political and social life and merge the country's sense of responsibility, the sense of mission and the view of the rights and obligations of self-awareness. It revolves around the relationship between the rights and obligations of citizens to reflect citizens' treat moral concepts, values, norms of behavior between the individual and the state, between the individual and society, between the individual and others. It emphasized that the sense of responsibility of people in social life, civic awareness, sense of democracy and other basic moral sense (Jiang, 2010).

Thus, the modern civic consciousness is the consciousness of the citizen's political sovereignty and is the sovereign consciousness to participate in the management of state affairs. It includes two levels of meaning; the right to participate in the management of state affairs and the sense of responsibility to maintain the good functioning of society. Specifically, these two levels of consciousness can be internalized as equality, freedom, national and public awareness.

1) **Equality Awareness**: Sense of equality is the core meaning of citizenship. Hellenistic polis citizens have limitations qualifications on an equal sense of identity. Necessary and sufficient conditions of the citizens of Athens Times is: if he has the right to participate in the proceedings and judicial functions of people, he is a citizen of that city (Wu, 1965). Since the bourgeois revolution in modern, citizen theory is more egalitarian than before and emphasize the equal rights of citizens in public affairs in the participating countries. Our Constitution also stipulates that citizens of People's Republic of China are equal before the law and every citizen enjoy the rights of Constitution and the law and must fulfill obligations under the Constitution and the law.

2) **Free Consciousness**: In general, freedom is acted on our own without any restrictions and constraints. Freedom consciousness is the awareness and understanding of the rights of citizens that is given by the law and is not restricted or limited.

3) **National Consciousness**: Citizens come from the city-state's rule, which intent has the regional restrictions. this concept has

subsequently changed, but in the modern national political system, the state is still a prerequisite for the survival and development of the citizens. Therefore, the national consciousness is the most basic consciousness of the citizen consciousness.

4) **Public Awareness**: In modern realm of politics, the citizens are the unity of rights and obligations. The society is made up of many citizens who must observe the public contract under the law. Only in this way, we can ensure the social develop orderly and sanely, which includes the awareness of participation in public affairs and the observation of social compliance.

2.2 Present situation of contemporary college students' civic awareness education

In this paper, the samples of college students' civic awareness survey are the Engineering College Students by questionnaire. From Sep 2015 to Nov 2015 in Heilongjiang Province, we issued 270 questionnaires in 3 colleges to investigate the current situation of College Students' civic consciousness. The questionnaire includes the citizen's equality consciousness, freedom consciousness, national consciousness and public consciousness, which let the students answer the question in details. In this investigation, the whole group sampling method was used to select the random sample in different undergraduate courses. The science students were issued 90 copies; the arts students were issued 90 copies; the engineering students were issued 90 copies, which the total numbers were 258 valid questionnaires with 95.6% effective recovery rate. The research results were analyzed by SAS® v. 9.2, which was a statistical analysis software, and then a discussion was conducted by using the analysis results.

3. RESULTS

The statistical analysis of the questionnaire shown that the students of our country's civic consciousness were in the following aspects:

1) **The national consciousness is strong, and the patriotic feeling is deep**

The survey shown that 96.9% of college students had a strong national consciousness with high national responsibility and patriotism. For example, the "Chinese Threat Theory", "Xinjiang Independence" and "Diao-Yu Islands" and other issues were expressed strongly concerns by students. We are proud of the achievements of our country's economic construction, but at the same time, we can see that the comprehensiveness of the basic values of the socialist system of our country and the traditional culture is less, which only 52.3% of the students have a firm belief.

2) **They approve the equality consciousness, but have no consciousness to fight for their rights strongly**

Survey shown that 77.5 percent of college students praised Martin Luther King and Nelson Mandela who are seeking the equal rights of black, which indicated that contemporary college students had widely approved the sense of equality. But 91.1 percent of college students surveyed in the face of unequal treatment will be endure, which indicated that college students have a greater inequality for tolerance because of the impact of traditional culture, and chose not to fight.

3) **They have a sense of freedom, but few students know the relationship between freedom and law**

Ninety eight point one percentage of the students for the pursuit of the spirit of freedom had a positive attitude identity and their understanding of the sense of freedom were correct. But pursuing the freedom of consciousness is not ideal. Most students can't treat well their own matter, and only a few students have a strong self-reliance.

4) **Their enthusiasm for participation in public affairs were not high, and didn't comprehensive understanding of civic awareness**

Public awareness can be divided into two sides: conscious participation in public affairs and civic awareness levels. Only 30.2% of the students were active in public affairs for the class, and 25.2% of students often concerned about national affairs, which reflects that the contemporary college student's enthusiastic participation in public affairs is not high. As to civic awareness, college students have a strong civic awareness in some respects. There were 80.2% of college students giving the old seats, and 95%of college students showing the stranger the way. However, nearly 60% of the students had run the red light. It is shown that the contemporary college students didn't fully cognitive the civic awareness and often handled matters by their feeling.

4. DISCUSSION

4.1 Reason Analysis

1) **Traditional cultural influences**

The so-called culture is that people gather together in the long life of social life (Sha, 1965). Our long history and cultural heritage of thousands of years of Chinese civilization produced many excellent traditional culture in the current world, which has a very positive meaning, such as the patriotic ideas that everyone is responsible for the rise and fall of our state, kindheartedness that is the basis of confucian morality and consciousness. These ideals are all coincided the contemporary connotation of the citizen consciousness. However, in traditional Chinese culture, the official oriented consciousness was very entrenched privilege since ancient times. The prerogative was act as a large and rigorous system and deeply rooted in the political, economic, cultural and social. The pursuing of equality and liberty was influenced by the imperial power or authority, and didn't get rid of dependence on people. This conflicted with the modern civic consciousness.

2) **Social development in transition**

Currently, our society is still in the political system that is not fully adapted to the stage of market economy. The lack of restraint system and the value system, the personal interests for economy, rampant materialism, the traditional moral bottom line was collapsed. The negative impact of social environment leaded the values of some college students accepting the negative tendency, weak sense of collective, serious money worship and hedonism. They only willing to enjoy the rights and willing to assume their responsibilities, but their civic awareness was weak.

3) **Lack of systematic citizen education**

The practice indicated that the formation of citizen's consciousness didn't separate from the acquired education. In recent world, the developed countries paid attention to the construction of citizen education system. Since reform and opening-up, China has gradually increased the degree of the attention to the citizen education. However, due to the lack of a sustainable education concept, excessive politicization, and one-sided emphasis on sermons it was resulted in that the citizen consciousness education of school didn't make students generate personality of independent, self-discipline, in contrast, produced the personality of the blind obedience that is incompatible with the civil society of contemporary democracy and rule by law (Gu, 2008).

4.2 Improving college students' awareness of citizen's consciousness

1) **Strengthen the ideological and political education and improve the political participation quality and ability of college students**

The current ideological and political education in college paid more attention to theory and less to practice, and the educational form is relatively single, which was uncoordinated between educators and education object. Therefore, the reform of the ideological and political education should be put on the agenda, and the traditional "spoon feeding' way of teaching method should be replaced. Raising the dominant position of young students in the course, which can stimulate their enthusiasm for politics, improve their political participation consciousness and behavior. The citizen consciousness education should guide students to establish a "political socialization' idea to cultivate obligations of concerning about the country, the society and the world, and should let students think that the politics are surely closed to themselves, and learning politics is useful for them. Thus, the students' political enthusiasm will be aroused.

2) **Create a good atmosphere for college students' civil education**

Due to historical reason, our country's democratic and citizen consciousness education degree was very low. The whole society cultural atmosphere was lack of the spirit of equality, freedom, faith and so on. Therefore, to get good effect of citizen education, our government, society and school must cooperate by whole hearts. Firstly, because the life and learning of college students are mainly in the campus, the campus environment will directly affect the cultivation and development of citizen consciousness of college students. Therefore, colleges and universities should make great efforts to establish the campus culture with full of freedom and equality thoughts, and encouraged and advocated the students' independent thinking to form a good cultivation environment of citizen consciousness.

Government departments must have a long-term education planning guidance and policy, and should also speed up the pace of the construction of the rule of law. The rule

of law is the appearance of the democratic spirit. The social environment of our country now should be optimized to make a complete legal system which is in accordance with the time values and to strengthen the publicity and education of all people who are same in front of the law, and to increase public opinion guidance to achieve promoting righteousness and exposing ugly to optimize the social environment of public opinion and establish good value orientation.

3) **Participate in school management and increase the chance of college students' political participation**

Participating in school by college students is one of the important characteristics of modern university system. It is also an important opportunity for college students to participate in students' politics, is the best interpretation of college students' citizen education. It has an important significance to promote the institutionalization, scientific and democratization of colleges and universities management. There are many various ways to participate in school management:

1. Participate in the formulation of university rules and regulations

Participating in the formulation of universities is a typical participatory governance for college students. University regulations are formulated as legislative activities, which should also be made in accordance with the requirements of due process. College students are the largest group in the university, so they should enjoy the right of management of the school and their own affairs. Participating in college management is the legal requirements.

2. Participate in the evaluation of teaching activities

With the method of students evaluating management departments, colleges and the interests of teachers' directly, students who are managers really have the identity and rights of management. Only the interests and needs of students have been paid attention and protected, the talent cultivation will be become as a central task for the college.

3. Participate in social work and widen the channels of political participation of college students

College students can go into the community, school and enterprise to participate in colorful social work as a volunteer. They can use group and intellectual advantages to carry out social surveys, understand the public opinion of people, and provide information on government. They can cooperate with social organizations to carry out public welfare activities, undertake the government public service projects and provide an assistance for the vulnerable groups in society. All in all, there are many various social practices waiting for college students to explore and develop continuously with subjective initiative.

5. CONCLUSION

With the rapid development of Chinese political and economy and the continuous changing of social structure, the contemporary college students' citizen consciousness need a higher requirement than before. In this paper, the current college students' citizen consciousness has carried on with the questionnaire survey. Analysis results shown that most of the current college students have strong national consciousness and patriotism and are strongly desiring for freedom and equality. College students have low enthusiasm on participation in public affairs and less comprehensive of public awareness. Therefore, we should insist on the educational thought of setting up and cultivating person's morality, should earnestly carry out educational work, and should make effort to cultivate the Chinese characteristics of the socialist builders.

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Conflict of interests

Authors declare no conflict of interest.

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SCENARIO-BASED ELEARNING AND STEM EDUCATION: A QUALITATIVE STUDY EXPLORING THE PERSPECTIVES OF EDUCATORS

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ABSTRACT

There are a variety of extra curricular activities and programs that aim to promote Science, Technology, Engineering, and Mathematics (STEM) education, but there are limited examples of extending STEM curriculum by employing scenario-based eLearning opportunities in a mobile lab learning environment. Following students participation in a first of its kind STEM Mobile Lab program that uses a scenario-based eLearning approach for instruction, twelve educators from four Title I elementary schools were asked about their perceptions of the influence of the Mobile Lab program on the STEM education of their students. The semi-structured interview protocol contained questions intended to explore participants' perceptions regarding the influence of a scenario-based eLearning Mobile STEM Lab program on the STEM interest and achievement of students. The study found that a scenario-based eLearning Mobile STEM Lab can influence STEM interest and achievement of elementary students. This promising finding leads to a recommendation for educators to use this approach and similar programs to make students more interested in science and improve their grades. Efforts by educators to design and implement scenario-based eLearning opportunities lead to increased learner engagement.

1. INTRODUCTION

The study of Science, Technology, Engineering, and Mathematics collectively is commonly referred to as STEM education and has become an important topic for researchers because of its role in jobs of the 21st century. However, rankings of American youth in science, engineering, and math have dropped significantly since the 1970s (National Science Board, 2003; Organisation for Economic Cooperation and Development, 2006). Reflective of the decline, American youth no longer believe the United States leads the way in invention (The Lemelson-MIT Invention Index, 2011). As the global economic competition gets tougher, American policymakers and researchers are interested in finding ways to increase the number of students pursuing STEM-related majors in order for the United States to continue its role as an economic powerhouse.

National statistics indicate that the next generation is prepared neither for today, nor for future demands (National Research Council [NRC], 2011). For instance, international indicators (e.g., TIMMS and PISA) have shown that U.S. students did not perform well in mathematics and science putting the U.S.'s global leadership in danger. In addition, other studies indicated that there was a decrease in graduation rates in STEM fields (National Science Foundation [NSF], 2010). Those who were trained for STEM-related careers were not sufficient to meet the country's needs (NRC, 2011). Assessment results like these indicate a need to develop STEM content and

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boost individuals' interest towards STEM-related careers. Lack of student knowledge in STEM and interest in STEM-related careers creates a major constraint for the development of the STEM workforce within the United States of America. There is a need to augment the STEM workforce in a technology-driven society, and create initiatives that develop STEM literacy and boost individuals' interest towards STEM-related professions.

The state of Maryland was the first state to set standards specific to STEM education (Petit, 2012). In April, 2012, the Maryland Board of Education decided to make STEM education a major component in all students' education by stating that the future of the entire nation depended on how schools prepare their students in STEM (Maryland State Department of Education, 2012). Prior to this declaration, several school districts in Maryland implemented initiatives to promote STEM fields to all students. STEM programs including robotics classes and clubs, partnerships with military and engineering organizations, and competitions based on STEM started to develop in the 1990s. Likewise, more schools were offering STEM-focused field trips to expose students to STEM ideas and activities.

As years passed, federal educational accountability policies began to focus more on science and state assessment systems and began to hold schools accountable for student learning in STEM in order to equip students to be college and career ready. The state of Florida enacted several initiatives to improve the quality of STEM education, further engaging students and inspiring future generations of STEM (Manno, 2012). In 2012, the Governor of Florida pushed for statewide education reform that aimed to improve the foundations of STEM education and inspire students to pursue STEM careers. This resulted in STEM fields being promoted through innovations and initiatives, including partnerships with corporate and collegiate sponsors, as well as exposure to new technological programs across the state.

Researchers in STEM education have found several key factors which are important in providing an effective, engaging STEM education. First, "It capitalizes on students' early interests and builds on what they know, and provides opportunities to engage in the practices of science and mathematics to sustain their interests" (STEM Smart, 2014, p. 2). It is important for educators to recognize the challenge of confirming instruction not only covers the most important science and math content, but can engage even bored, distracted, unmotivated students (STEM Smart, 2014). Another report, completed by Hanover Research, stated best practices in elementary STEM programs include "instructional techniques, curriculum and programs, out-of-class activities, the importance of highly-qualified teachers, and longterm program sustainability" (Hanover Research, 2012, p. 10). Some common instructional techniques often used in STEM schools include "traditional teacher-led instruction, project-based learning, workplace or lab-based learning, and the use of technology-supported learning tools" (Hanover Research, 2012, p. 10).

While different educational theories (functionalism, progressivism, reconstructionism, existentialism, cooperative learning) support learning approaches that make learning engaging and meaningful, the scenario-based, e-learning in STEM Mobile Lab program utilizes an experientialism approach to improve student performance. Experientialism is grounded in the idea that experience is the source of knowledge (Dewey, 1938). The STEM Mobile Lab in this study offers students an opportunity to engage with each other and with science content by experiencing an authentic scenario. Students engage in active learning as they process and respond to the scenario using technology-supported learning tools to access curriculum which is described as eLearning. Scenario based eLearning is an effective approach that provides an excellent framework for active learning (Elmore, Mariappan, and Hays, 2003). This approach is based on the understanding that in order for a learner to acquire and retain skills and knowledge, the learner must be placed in a scenario where his/her decisions affect, or alter subsequent events leading to new events.

In order to have a successful integration of STEM education, there are several characteristics that must be implemented (Carnegie Science Center, 2014). A STEM education will be successful when the four major features of STEM education are met. Those four features include STEM being "collaborative, hands-on, problem-solving, and project-based" (Carnegie Science Center, 2014, p. 15). A collaborative learning approach for students closely resembles the real-world setting which students will encounter in future careers (Carnegie Science Center, 2014).

Described in the context of cognitive and constructivist learning theories, problem-based learning is a student centered experiential learning strategy that involves small

group activities with teachers as facilitators or guides (Barrows, 1996; Gallagher and Gal-lagher, 2013; Grider, 1993; Gijselaers, 1996). While problems become both the focus and stimulus for learning, knowledge is gained through self-directed learning (Honey et al., 2014). Numerous studies support the finding of students in PBL environments are motivated and engaged (Gallaher and Gallagher, 2013). However, literature related to extending the STEM curriculum by employing scenario-based eLearning opportunities in a mobile lab learning environment is limited making research in this field urgent.

A hands-on STEM education offers students a plethora of ways to explore science, technology, engineering, and mathematics. This leads to more student engagement when compared to simply memorizing and taking tests. The problem-solving aspect of STEM education refers to presenting students with a challenge and requiring them to figure out how to solve that particular challenge. Finally, project-based learning involves providing instructions to complete a project (Carnegie Science Center, 2014). Scenario-based eLearning incorporate all four factors to teach science.

This study explores the influence of a scenario-based eLearning mobile lab on STEM education through the eyes of elementary school educators. Scenario-based eLearning is considered as an approach to improve learner engagement and understanding by occupying students in real world learning experiences. Engaging in real world activities are suggested as an effective way of learning by experimental learning theory. Therefore, experiential learning theory is used as a conceptual framework for this study. Emphasis is placed on the perceptions of teachers, instructional designers, and administrators regarding the influence of a scenario-based eLearning STEM mobile lab program on the STEM interest and achievement of fifth grade students.

2. MATERIALS AND METHODS

The perceptions of educators in a school district in the Southeast United States of America are explored as a qualitative study of the influence of a scenario-based eLearning Mobile STEM Lab program on the STEM interest and achievement of fifth grade students. A qualitative study allowed for in-depth research, which provided a richer understanding of the participants that is not obvious through quantitative data collection (Merriam, 2009).

The Mobile STEM Lab program was developed and implemented in a school district which educated over 61,000 students with a little less than 20,000 of students attending elementary school during the 2015-2016 school year. The program was offered to fifth grade students throughout the district who attended Title I elementary schools. A school is determined to be a Title I school by high numbers or high percentages of children enrolled from low-income families. The following four questions were used to guide this research:

1. What are instructional leaders and teachers' perspectives regarding the influence of a scenario based eLearning STEM Mobile Lab program on the attitudes and interest in STEM of fifth grade students?
2. What are instructional leaders and teachers' perspectives regarding the influence of a scenario based eLearning STEM Mobile Lab program on the interest of fifth grade students in pursuing STEM-related careers?
3. What are instructional leaders and teachers' perspectives regarding the influence of a scenario based eLearning STEM Mobile Lab program on the achievement of fifth grade students in STEM-related subjects?
4. What are instructional leaders and teachers' perspectives regarding the challenges and implications of implementing a scenario based eLearning STEM Mobile Lab program in the schools?

The participants in this study were elementary school educators from across the school district. The sample consisted of 12 educators who were selected from a population of 5, 213 educators. Educators were selected for the sample through a non-probabilistic, purposive sampling procedure, in which the population was narrowed based on essential attributes. The 12 educators assumed three different types of roles within a school. Eight of the participants were teachers, two of the participants were instructional designers, and two were elementary school administrators. Within the eight teachers, five had less than three years experience teaching STEM courses and three teachers had between three and seven years experience teaching STEM courses to fifth grade students. Both of the instructional designers had between three and five years experience as STEM instructional designers which provide instructional support and resources to support STEM education within the entire school. One of the administrators had less than three years experience as an administrator and another had less than five years experience. All of the participants were as-

signed to their respective positions during the entire school year. All of the participants were directly involved in the implementation of the Mobile STEM lab program and observed students participating in STEM education lessons before, during and after the implementation of the Mobile STEM Lab program. There were 8 females and 4 males, of average age of 34.4 years. Six of the participants were Caucasian, 1 was African American, 4 were Hispanic, and 1 was Asian.

Within the school district, schools are ranked annually by determining the percentage of the students receiving free and reduced lunch and are given priority to qualify as a Title I school on the basis of the percentage of students from low income families. During the 2015-2016 school year, 17 out of 24 elementary schools across the school district were identified as Title I school which included approximately 2, 214 fifth grade students divided across 138 classes. Of the 17 Title I schools initially identified in the school district, 4 schools agreed to participate in the study. Total enrollment of fifth grade students of the participating schools ranged from 112 students to 182 students per school. All the schools in the study had high percentages of free and reduced lunch students, ranging from 79% to 93%, with a weighted average of 82.18% across the schools. Many of the schools had a high percentage of minority students, ranging from 45% to 89%, with a weighted average of 66.40% across the schools. The number of English Language Learners also varied widely, ranging from 15% - 63%, with a weighted average of 24.12% across the schools. Under the school accountability program of Florida, schools are graded as A, B, C, D, or F based on the academic performance and learning gain measurements of students. Within the 4 schools that participated in the study, one school received a grade of A, one school received a grade of B, and two schools received a grade of C. Forty-one to 53 percent of students meeting or exceeding the benchmark score (passing) on state standardized assessments and/or making learning gains from the previous academic year represents a school grade of C. The percentage range for a school grade of B is 54 to 61 percent, and the percentage range for a school grade of A is 62 percent or greater. It is hoped that the description of participants' demographics and school types help applying the results of this study into the similar situations with similar demographics.

Mobile STEM Lab program. A school district in the southeast region of the United States of America has implemented a Mobile STEM Lab that serves as an extension of the STEM curriculum. Among some of the goals for the program, the Mobile STEM Lab aims to enhance fifth graders STEM content knowledge and application through a scenario-based eLearning approach. The innovative Mobile STEM Lab, the first of its kind in the nation for a K-12 school district, aims to connect students to the future by creating engaging and exciting STEM experiences for students by immersing them in authentic scenarios that requires the application of STEM content to solve problems.

The Mobile STEM Lab program was designed as a means for implementing science lessons that are engaging and provide learners with the resources to enhance their performance and overall knowledge. Educational technology is utilized in the mobile lab as instructional tools to enhance the ways that teams of students understand the scenario, gain content STEM content knowledge, interact with each other, and apply STEM knowledge to solve authentic problems. The hope was that as students participated in engaging and positive STEM experiences over time, they would become interested in real life STEM related problems, and ultimately, STEM-related careers. During the 2015-2016 school year, the Mobile STEM Lab spent two to four days at each Title I elementary school to provide the program to all of the fifth grade students at the school. Some schools had 4-5 fifth grade classes while other schools had up to 6 classes which meant that the mobile lab was at that particular school for a longer period of time to accommodate a larger number of classes. Students participated in the STEM Mobile Lab session for 60 minutes.

The Mobile lab consists of a 45-foot motor coach outfitted with seven interactive hands-on student learning stations. Fifth grade students engage in hurricane-themed, standards-based learning. The hurricane scenario was the only scenario offered to students during each session during the first year of the STEM Mobile Lab program. This topic provided an authentic problem for students as hurricanes have the potential to be a natural disaster for students and their communities in this particular geographic area. The session begins with students getting acquainted with the problem as a context for learning while inside the mobile lab. The problem is presented using technological tools such as multimedia and special effects inside the mobile lab to depict that a natural disaster in the form

of a hurricane has hit the community. Then, students respond to the problem through their critical response teams in different areas of the lab which consist of medical and biological technology and geological, environmental, electrical, structural, and meteorological engineering. All of these teams work together to address the scenario of the hurricane destroying the community.

Working in teams of 4 to 5, students use technological tools to within the mobile lab to gather information and apply it in order to make decisions that can help save and preserve the lives of individuals in the community after the destruction. The content is grounded on STEM-related standards that are implemented an interdisciplinary approach rather than treating the individual subjects as standalone subjects. This type of instructional design approach supports a "coherent and rigorous curriculum" that is crucial for a STEM initiative in any school to be successful. Those in support of STEM education advocate STEM is the "interrelated nature of all the STEM subjects and the necessity of implementing an interdisciplinary approach rather than treating the individual subjects as standalone subjects" (Hanover Research 2012, p. 8).

This paper draws on qualitative data collected by the author through semistructured interviews. The interview protocol contained questions intended to explore participants' perceptions regarding the influence of a scenario-based eLearning Mobile STEM Lab program on the STEM interest and achievement of fifth grade students. After receiving permission from the school district, the qualitative data was collected from three different groups of educators: fifth grade teachers, instructional designers, and administrators. Participants from each of these groups were prompted with a different series of interview questions that were designed to relate to their role and interactions with students within the school. These questions were designed to capture knowledge on the influence of a scenario-based eLearning Mobile STEM Lab on STEM education through the eyes of elementary school educators. Interview questions were developed based upon previous research related to scenario-based learning and experimental learning theory which is used as the conceptual framework of this study.

The author asked several open-ended questions shown in Table 1, Table 2, and Table 3 along with follow-up probes to clarify or learn more about the response of the respondent. Active listening feedback was also provided to gain more indepth understanding and/or to clarify the statements of participants. Participants were invited to describe their perceptions and tell stories of their experiences. Responses to questions were recorded using a Google Voice voicemail feature. After the introduction and the opening script of the interview was shared with the participant, the interviewer conducted a three way call by calling a specific Google Voice phone number and connecting the three calls. Once the call was transmitted, the interviewer waited until the voice mail feature was prompted and then stated the interview question. Following the research question, the participants provided their initial response and any responses to probes or clarifying questions. The dialogue between the interviewer and respondent was captured as a voicemail by Google Voice. As a Google Voice service, each voicemail was recorded and voice transcribed by Google Voice and sent to the interviewer as an email. The accuracy of each transcript was confirmed by the researcher by listening to the audio recording and reviewing the transcription.

A content analysis of the interviews (Miles and Huberman, 1994) was conducted. Interviews were analyzed, beginning with category construction in which participants' responses were analyzed for major themes and ideas (Maxwell, 2013). From these themes, categories were then created to further analyze other interview transcripts. This coding process allowed the researcher to see possibilities for research results. As more interviews and observations were added to the research, some categories became more apparent. It was expected that data would be related to the overarching categories of improved attitudes and interest towards STEM, interest in STEM related careers, increased academic achievement in STEM, and challenges and implications for implementing a scenario-based eLearning Mobile STEM Lab in school districts.

3. RESULTS

Attitudes and interest towards STEM. The first research question asked, What are instructional leaders and teachers' perspectives regarding the influence of a scenario based eLearning STEM Mobile Lab program on the attitudes and interest in STEM of fifth grade students? To answer this question, indicators of improved attitudes and interest in STEM were coded. The categories that emerged from the responses of the educators included en-

gaged and interested which were generated from the most common words used by educators consisting of fun, excited, and energetic. The content analysis revealed that all of the participants had observed improvements in the attitudes and interest towards STEM based on student behaviors. For example, Participant 2 responded, "The scenario-based eLearning experiences allowed for students to be less hesitant to try new things, which helps their attitude because they are more interested in trying science and engineering. The interest level of students is higher and their ability to pick and choose and where they are going in the next phase is new to them." Similarly, Participant 5 revealed improved student interest in STEM through the following statement, "I look at the smiles on the kids' faces and see how happy they are in the program. They like showing me their work; their products. They are excited to show how things work. I remember one student coming up to me with a solution and saying, 'I was thinking about how to solve this issue and then, Ba-ba-boey, it hit me! In order for people to communicate with each other, they need something that will work without electricity so I added pen and paper to my hurricane survival kit.' Students enjoy reporting their ideas and solutions from the scenarios." This comment reflects increases in student interest in STEM and includes students displaying positive emotions which are associated with the scenario-based eLearning experiences.

The content analysis of the participant's responses to the attitudes and interest prompt revealed students being more engaged in learning during STEM and non-STEM courses when scenario-based learning opportunities were integrated in the lesson. For example, Participant 1 responded, "The scenario-based eLearning experience in the Mobile STEM Lab was a very positive experience for students and it has made me realize that they want to do more like this in the rest of the day. When I allow for students to work in teams and problem solve a real life scenario, the instruction is more student centered. Students have a lot of input as to the process or the product of what it is they are doing and learning." Participant 8 stated, "Some of the more hesitant students who normally do not succeed are becoming leaders in the classroom with all the opportunities that scenario-based learning has to offer. Students are more engaged in the lessons due to the hands on and inquiry-based learning." Participant 11 shared, "I have seen students more interested, inquisitive and thinking, thus figuring out the answer for themselves. Some students have begun to engage in research throughout the day in different classes. They research a topic or concept based on a question that they have. I have seen them use different resources for research including non-fictions texts from our classroom library and then sharing what they find with their peers." These statements are evidence of shifts in student engagement and excitement in learning as observable outcomes for improved student attitudes and interests in STEM, and are anticipated to be influenced by scenario-based eLearning.

Interest in STEM-related careers. The second research question asked, What are instructional leaders and teachers' perspectives regarding the influence of a scenario based eLearning STEM Mobile Lab program on the interest of fifth grade students in pursuing STEM-related careers? To answer this question the result of the coding for student STEM-related career interests was examined. The categories that emerged from the responses of the educators included open-minded, chance, and variation which were generated from the most common words used by educators consisting of possibility, thought, change, and idea. The analysis revealed that positive scenario-based eLearning experiences in the Mobile STEM Lab led the participants to perceive shifts in students considering to pursue STEM-related careers. Participant 7 shared, "From talking with students and classroom observations, the experiences with the Mobile STEM lab have "really helped students define, or not define, what they want to be when they grow up. With so much application and hands-on experiences, students really get a good idea if they want to pursue post secondary degrees and careers in engineering or science." Participant 2 responded, "Each scenario set students up to help their community or solve a real life problem. I believe that students enjoy making positive contributions to their world which helps to think more about a career related to STEM." Participant 12 shared the thoughts of one of the students who experienced the activities in the Mobile STEM Lab by saying, "One student shared that the games opened my eyes to the possibility of a STEM job. I learned that it was not impossible to do stuff like that and it made me like science and math more." Participant 3 shared the thoughts of a student by sharing, "I always thought that I would be an athlete or artist or something like that. I've kinda thought about math and science as just a subject in school." Participant

responses make apparent that scenario-based eLearning Mobile STEM Lab influenced an improved interest in STEM-related careers of fifth grade students. Many participants described the Mobile STEM Lab experience as a means for expanding student awareness of STEM career opportunities.

Increased academic achievement in STEM. The third research question asked, What are instructional leaders and teachers' perspectives regarding the influence of a scenario based eLearning STEM Mobile Lab program on the achievement of fifth grade students in STEM-related subjects? To answer this question, coding results were examined corresponding to student academic development, particularly identifying responses that describe ways students have displayed classroom behaviors that have the potential to lead to academic success. The categories that emerged from the responses of the educators included thinking, problem solving, and collaboration which were generated from the most common words used by educators consisting of together, interaction, application, and helping. The content analysis to achievement prompt revealed that students academically benefitted from scenario-based eLearning experiences. Participant 9 focused on scenario-based eLearning providing students with opportunities to become problem solvers and critical thinkers. "Besides the higher level of what they are being asked to do, they have to think, not regurgitate information. They have to be creative and apply their knowledge to real world settings." Many participants recognized students interacting with each other in a positive manner. Participant 10 shared, "Working on a specific scenario, students not only engage in active learning, but they are also exposed to group interaction; thus socialization/collaboration becomes an integral part of the learning process." Similarly, Participant 12 responded, "The activities allow for students to communicate orally which helps them to improve their ability to work in teams and interact with other people.

The content analysis of the participant's responses to the achievement prompt revealed students being more responsible for their learning. As Participant 6 stated, "Some students have matured and started to recognize their role as an active learner and group collaborator, and they realize that learning becomes their responsibility. Some students are starting to realize that it is not the teacher's fault if they do not learn something." Participant 1 provided a more sensitive way that they perceived students to be more responsible for their learning by saying, "When you say something to them or provide a limitation to their learning or thinking, their response isn't just compliance or just acceptance, they want to figure out how to solve it and how to change it."

Many teacher participants had responses that were similar to Participant 5, who stated, "After students experienced the scenario-based lesson in the Mobile STEM Lab, they saw the importance of being really good team players and team leaders. They began to understand that they needed to be very good problem solvers, very good critical thinkers, very good at time management, and very good at data and collection and analysis. These are critical skills businesses need and cannot be taught." These perceptions provide evidence that the scenario-based eLearning experience provides opportunities for students to develop leadership and collaborative skills that further prepares them for the workforce and for college.

Challenges and implications for implementing a scenario based eLearning STEM Mobile Lab program. The fourth research question asked, What are instructional leaders and teachers' perspectives regarding the challenges and implications of implementing a scenario based eLearning STEM Mobile Lab program in the schools? To answer this question the result of the coding for challenges and implications for implementing a scenario-based eLearning Mobile STEM Lab in school districts was examined. The categories that emerged from the responses of the educators included hands-on, application, and interactive which were generated from the most common words used by educators consisting of active, technological tools, think, and problem solve. Analysis revealed that scenario-based eLearning Mobile STEM Lab has encouraged students to think about how to solve real life problems through STEM application and has sparked a STEM interest for more students. For example, Participant 7 believes the Mobile STEM Lab was a "huge asset" for encouraging students to be creative with science and math. Continuing on, the participant identified the "hands-on nature of the curriculum" as a strength, as well as the fact that "students get to solve a real-life problem by completing a process from start to finish." Similarly, Participant 9 shared that the Mobile STEM Lab "has helped our STEM instruction to evolve. Because society and the workforce require more technical jobs, we need to expose our students

to those types of experiences. We need to show our students what they can do with this learning, what the next steps are for them, and what kind of training they can expect in the future. We have to get students interested in these fields." Some of the participants indicated that a scenario-based eLearning approach provided a fun way for students to interact with STEM concepts and they wanted to continue helping students understand how they could make a living and contribute to their community with STEM content.

It does appear that teacher knowledge in STEM provides a challenge for implementing a scenario-based eLearning Mobile STEM Lab program. As Participant 3 stated, "As I reflect on my content knowledge and talk with my colleagues, teachers need help in seeing themselves as STEM capable." Participant 11 shared, "One challenge for me is that I do not recognize that STEM is everywhere." Similarly, Participant 7 stated, "If teachers can better understand the STEM world in which they live, they would better understand the applications of science and math in STEM careers." These responses make apparent that professional development designed to increase STEM content knowledge can assist teachers in connecting the STEM setting with the regular class setting and help them to conceptualize that the STEM mindset is one of a problem-solving mentality.

4. DISCUSSIONS

It can be inferred from the content analysis and coding of participant responses that instructional leaders and teachers perceive that a scenario-based eLearning Mobile STEM Lab program can influence the quality of the STEM education for students. Educators interviewed were of like mind regarding the benefits for students, making evident that a scenario-based eLearning Mobile STEM Lab program influenced student achievement and the attitudes and interests of students toward STEM and STEM related careers.

This research study was intended for 8-15 interview participants, which is typical for qualitative studies of this nature. In this qualitative research, interviews provided a first-hand view of the influence that scenario-based eLearning has exerted on improving student achievement and improving the attitudes and interests of students toward STEM and STEM related careers through reflection.

In this study, the perceptions of educators were consistent with each other and all shed a positive light on having students participate in out-of-class activities as a means for cultivating a STEM interest. Also, perceptions connected with the four major features of successful integration of STEM education, as reported by the Carnegie Science Center (2014) which consist of "collaborative, hands-on, problem-solving, and project-based".

Hom (2014) discussed that STEM education in elementary schools should focus on basic STEM concepts and create an awareness of the STEM field and possible occupations. Chesloff (2013) added by sharing that a high-quality STEM learning environment provides students with a structure to build upon their natural disposition to explore, build, and question. A scenario-based eLearning approach to STEM education provides a hands on experience for students to explore and apply STEM concepts to solve a real life problem. This leads to more student engagement when compared to simply memorizing and taking tests (Carnegie Science Center, 2014).

The results of this study confirm that students benefitted from an instructional approach grounded in the experientialism learning theory. A hands-on experience in the Mobile STEM Lab provided students with an active way to explore science, technology, engineering, and mathematics. The results of this study suggest that educators perceived students to be engaged in this type of active learning and influenced the interest of students in STEM. The practical implications of the findings confirmed that as students participated in engaging and positive STEM experiences that they would become interested in STEM and STEM related careers.

There are a variety of extra curricular activities and programs that aim to promote STEM education, but there are limited examples of extending the STEM curriculum by employing scenario-based eLearning opportunity in a mobile lab learning environment. A scenario-based eLearning Mobile STEM Lab requires students to engage with each other and apply STEM content to solve problems that can be found in realistic scenarios. The social implications of this study was related to the need to augment the STEM workforce in a technology-driven society and create initiatives that develop STEM achievement and boost individuals' interest towards STEM-related professions. Scenario-based eLearning provides educators with the opportunity to create STEM lessons that are fully engaging for the learner and provide them with the

resources to enhance their performance and their overall knowledge base.

Educators can find value in this qualitative study as the findings reveal that a scenario-based eLearning Mobile STEM Lab can influence STEM interest and achievement of elementary students. This promising finding leads to a recommendation for educators to use this approach and similar programs to make students more interested in science and improve their grades. Efforts by educators to design and implement scenario-based eLearning opportunities lead to increased learner engagement. In particular, students are encouraged to participate more in authentic learning activities that provide positive and engaging STEM experiences which can improve the interests of students toward STEM and STEM related careers.

5. CONCLUSIONS

Scenario-based eLearning experiences in a Mobile STEM Lab learning environment have been found to influence student learning related to STEM. Scenario-based eLearning experiences can improve student attitudes, interests, and achievement related to STEM as well as improve interests in STEM-related careers. Further, engaging and positive STEM learning experiences have the potential to improve student attitudes, interests, and achievement towards STEM throughout the instructional day rather than only in STEM classes.

There are a couple of limitations to this study. First, the information the participants provided in reflecting on their experiences was not cross validated by observations of the students. Although different groups of educators were interviewed to gather data from different sources, observations and interviews of the students working in the Mobile STEM lab and in the classroom may provide additional impact for a scenario-based eLearning Mobile STEM Lab on the students. Likewise, the collection of data for this STEM Mobile lab program was conducted after the first year of implementation. As the program continues to be implemented over time, additional quantitative and qualitative data collection may provide additional insight into the impact of scenario-based eLearning experiences in a Mobile STEM Lab learning environment on student learning in order to confirm these initial findings with a larger sample.

Another limitation of the study reported here involves the small and select nature of the population of students under study. This research study was intended for 12-18 interview participants, which is typical for qualitative studies of this nature. However, 12 educators were sampled in a single school district. As the study was conducted in a school district located in the southeast of the United States of America, the participants in this study may act in a way that is normal to those native to the area. Any time research is conducted in one specific area, it is difficult to anticipate how the results could be applied to different situations. It is hoped that the description of participants' demographics and school types help applying the results into the similar situations with similar demographics.

It is notable that the collection of data from instructional leaders and teachers in a wider range of STEM Labs and initiatives that utilize a scenario-based eLearning approach may reveal results. It is encouraged that others studying scenario-based eLearning delivered in Mobile STEM Labs to gather data similar to those that were collected in this study to determine the extent to which other scenario-based eLearning Mobile STEM Labs are influencing student achievement and the attitudes and interests of students toward STEM and STEM related careers. Further, the collection of data from a large number of participants would provide the statistical power necessary to effectively conduct analyses to both quantitative and qualitative data.

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Conflict of interests

The authors declare no conflict of interest.

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APPENDIX

Table 1. Teacher structured interview questions and the alignment to the research questions of the study

Interview question	Research question
What have you noticed about the attitudes of students in your class related to STEM before and after the implementation of the STEM Mobile Lab program?	1
What have you noticed about the level of interest of students in your class related to STEM before and after the implementation of the STEM Mobile Lab program?	1
What did your students like best about the STEM Mobile Lab program? What evidence have you observed in your classroom to make this conclusion?	1
How would you describe the career interests of students before participating in a STEM Mobile Lab session?	2
What have you noticed about the career interests of students in your class after the implementation of the STEM Mobile Lab program?	2
How has the STEM Mobile Lab program changed the achievement level of students in STEM related subjects? How do you know?	2
What kind of experience did the STEM Mobile Lab program provide for your students?	4

Table 2. Instructional designer struc-tured interview questions and the alignment to the research questions of the study

Interview question	Research question
What have you noticed about the attitudes of students in your class related to STEM before and after the implementation of the STEM Mobile Lab program?	1
What have you noticed about the level of interest of students in your class related to STEM before and after the implementation of the STEM Mobile Lab program?	1
What kinds of learning activities in the STEM Mobile Lab do you perceive to be the most engaging for students? What evidence have you observed to make this conclusion?	1
How would you describe the career interests of students before participating in a STEM Mobile Lab session?	2
What have you noticed about the career interests of students in your class after the implementation of the STEM Mobile Lab program?	2
How has the STEM Mobile Lab program changed the achievement level of students in STEM related subjects? How do you know?	3
What (if any) information did you receive from teachers about student achievement level in STEM related subjects?	3
How would you describe the learning environment of the STEM Mobile Lab?	4
What (if any) are the challenges of implementing a STEM Mobile Lab? What evidence have you observed to make this conclusion?	4
What (if any) are the implications of implementing a STEM Mobile Lab? What evidence have you observed to make this conclusion?	4

Table 3. Administrator structured inter-view questions and the alignment to the re-search questions of the study

Interview question	Research question
Has the STEM Mobile Lab program changed the overall interest level of fifth grade students in your school about STEM? How do you know?	1
What (if any) information did you receive from parents/caretakers about the attitudes and interests of their children related to STEM before and after the implementation of the STEM Mobile Lab program.	1
How would you describe the career interests of students before participating in a STEM Mobile Lab session?	2
What have you noticed about the career interests of students in your class after the implementation of the STEM Mobile Lab program?	2
Has the STEM Mobile Lab program changed the overall interest level of fifth grade students in your school about pursuing STEM related careers? How do you know?	2
How has the STEM Mobile Lab program changed the achievement level of students in STEM related subjects? How do you know?	3
What (if any) information did you receive from teachers about student achievement level in STEM related subjects?	3
What (if any) are the challenges of implementing a STEM Mobile Lab? What evidence have you observed to make this conclusion?	4
What (if any) are the implications of implementing a STEM Mobile Lab? What evidence have you observed to make this conclusion?	4
How would you describe the overall school energy/culture when the STEM Mobile Lab is on campus? What evidence have you observed to make this description?	4

THE ROLE OF THE SCHOOL COUNSELLOR IN SCHOOL–COMMUNITY COLLABORATION: THE CASE OF SLOVENIA

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ABSTRACT

The article presents some essential characteristics of collaboration between the school counselling service and individuals or institutions in the community. The role of school counselling in Slovenia is not limited merely to counselling and providing direct assistance to students with learning and their personal development. Rather, it includes the encouragement of all participants in the educational process to create adequate learning environments. The role, however, should also be understood in broader terms as organizational and content collaboration with external environments, institutions and individuals in the community. The authors begin by proposing some starting points for collaboration between the school counselling service and the local community and, in the second part of the article, they move on to the findings of their empirical research study, conducted on a representative sample of school counsellors working in Slovenian primary schools. The results prove the need for collaboration between the school counselling service and different institutions or individuals in the community. The authors primarily focus on examining the obstacles and drawbacks to the collaboration, while they simultaneously highlight examples of good practice that enable constructive collaboration, without which schools and school-based counselling would not be able to contribute to educational processes. The described examples demonstrate that collaboration between schools/school counsellors and institutions/individuals in the community is crucial to solving the problems that students and their families face.

1. INTRODUCTION

Writing on collaboration among schools, parents and the community today and in the past, various authors (e.g. Bryan and Henry, 2008; Bryan and Holcomb-McCoy, 2007; Epstein, 1995; Sheridan et al., 2002; Vidmar, 2015; Walsh and DePaul, 2011) define partnership as cooperation among a number of related individuals/institutions who have common goals and who establish a trustworthy relationship in which they share resources, power and responsibilities. Good-quality collaboration among schools, parents and the community primarily benefits children's (students') development and achievements, but there are also advantages to be gained by parents, teachers, schools and the community as a whole (Epstein, 1995; Sheridan et al., 2002; cf. Thompson, 2012). We have already written on the characteristics and advantages of collaboration among schools, parents and the community elsewhere (see e.g. Kalin et al., 2009; Šteh, Kalin, and Gregorčič Mrvar, 2015). Thus, this article focuses on the role of professional school counselling, which a number of authors (e.g. Bryan and Holcomb-McCoy, 2007; Čačinovič Vogrinčič, 1999; Epstein and Van Voorhis, 2010; Griffin and Steen, 2010; Resman, 1999; Walsh and DePaul, 2011) identify as an important factor in collaboration among schools, parents and the community.

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The first part of the article presents some bases for the collaboration of the school counselling service (In Slovenia the school counselling service is one of the subsystems of a school or preschool, so its primary goal is determined by the primary goal of the school or preschool. Different experts (e.g. pedagogues, psychologists, social workers, social pedagogues, special pedagogues, etc.) work in the school counselling service. It is an interdisciplinary professional school or preschool service) with individuals and institutions in the community. The second part elaborates on the findings of our empirical research study of this collaboration that was conducted among school counsellors in the autumn of 2014.

1.1 Bases for the collaboration of the school counselling service with individuals and institutions in the community

According to Resman (Resman, 1999, pp. 68-69) and Programme guidelines (Programske smernice, 2008.) is a key document serving as a basic orientation/framework for the work of the school counselling service in Slovenia. The document covers all educational subsystems – preschools, primary schools and secondary schools), school counselling as it has been conceptualized in Slovenia was never meant only to assist students in their personal development and learning. Therefore, it provides not only student counselling, directly helping students with their growth and progress, but also indirect help in terms of collaboration on the creation of adequate school environments as well as educational work and processes. This means that when looking after the child's holistic development, it is necessary to look after the conditions for this development, to provide for an adequate physical and social environment. And to be able to do that, school counsellors have to work closely with the school's staff, classes, management, with parents and the external environment (i.e. the community) (ibid.).

Performing three interrelated types of activities, the school counselling service participates in solving complex pedagogical, psychological and social issues in schools concerning everybody attending or working in schools (Programske smernice, 2008). These are activities of *assistance*, *development and prevention* and *planning and evaluation* (ibid., p. 15). Undertaking these three main types of activities, it helps everybody in schools and it collaborates with them in the following areas of everyday life and work in school: learning and teaching; school culture, school climate and order; physical, personal and social development; schooling and career orientation; social and economic difficulties (ibid.). In each of the areas the school counsellor's work includes: work with students, teachers, parents, school management and external institutions. Due to a complex interrelation of pedagogical, psychological and social issues the school counselling service is at its most effective when it incorporates a team of diverse experts. Thus, it is important that counsellors of different professional profiles from different schools cooperate, and that school counsellors also cooperate with experts from relevant external institutions (ibid.).

The school counselling service should, therefore, see beyond the school wall, looking for additional support, assistance and resources in the community, which will primarily benefit the child (the student) as well as others in schools – teachers, school management, parents, etc. (cf. Bryan and Henry, 2008; Bryan and Holcomb-McCoy, 2007; Chen-Hayes, Ockerman, and Mason, 2014; Thompson, 2012; Walsh and DePaul, 2011).

Although school counsellors often cite various obstacles to collaboration with individuals and institutions in the community (e.g. a lot of paperwork, a lack of time, etc.), the majority nevertheless deem school–family–community partnerships important and necessary (Bryan and Holcomb-McCoy, 2007; Griffin and Steen, 2010; Kalin et al., 2009).

The levels of the collaboration of school counselling with individuals and institutions in the community

Both schools and school counsellors require collaboration with individuals and institutions in the community, including parents, to be conducted at two levels (Čačinovič Vogrinčič, 1999; Davis, 2014):

1. Collaboration needs *to support school work in general, that is, to ensure good-quality educational work as a whole*; schools and school counsellors also need *collaborators and partners in conducting joint activities, programmes, projects*, etc.; sometimes these are group activities, sometimes only individuals are addressed, at other times it is small or big groups from the school or the community, etc. (ibid.); because of educational work as a whole, collaboration has to be established,

cultivated and maintained wherever it occurs.

It cannot be expected that schools will, on their own, be able to meet all the various needs, wishes and expectations expressed by the students and parents entering the school environment. This is particularly relevant in multicultural, democratic societies, in which individuals do not share all values and schools are formally obliged to respect parents' right to such education of their children that does not clash with the parents' religious, philosophical or other beliefs. Teachers and school counsellors are, furthermore, obliged to act educationally so as not to exclude or favour anybody (for more on that see Šebart, 2015). Special attention should be given to those coming from underprivileged social groups or discouraging environments, in which the young are more frequently exposed to risky behaviour (e.g. violence, drug and/or alcohol abuse, etc.) (Bryan and Henry, 2008; Sheridan et al., 2002; Walsh and DePaul, 2011). The task of schools is to act for *all* students, but especially for the underprivileged, as a protective factor shielding them against risk factors and negative experiences and enable them good-quality educational work (Hočevar, Kovač Šebart, and Mažgon, 2014).

With this in mind school counsellors collaborate with parents, the community (i.e. the student's and family's wider environment) when performing their key activities. They can participate in the collaboration in a variety of ways (Bryan and Holcomb-McCoy, 2007; Davis, 2014; Epstein and Van Voorhis, 2010; Walsh and DePaul, 2011): they can either indirectly circulate or gather information, develop materials, make expert suggestions and recommendations, make referrals outside schools or simply use information for further work with students, parents, teachers and head teachers. Nevertheless, according to the tasks of the school counselling service, school counsellors should act mainly as the *initiators* of collaboration and cooperation between schools and the community and *encourage developing, conducting and evaluating joint collaboration activities*.

In their role as initiators of collaboration and cooperation, school counsellors should integrate coordination as a form of school-based counselling into their work (cf. Bryan and Holcomb-McCoy, 2007). Coordination is "[…] a process in which school counsellors take the initiative in managing and leading the activities or programmes related to the growth, development, life and work of individuals or groups of students/children" (Resman 1999, p. 71). The role of the coordinator includes the school counsellor's participation in the teams, projects and activities which relate to the training of teachers and parents, and her/his participation in the projects between schools and/or parents and external institutions (ibid.).

2. *At the second level* both schools and school counsellors require collaboration with individuals and institutions in the community *to support the students who need assistance*; individuals and institutions in the community are also needed as *collaborators and partners* in *counselling and consultation work* when students experience problems and difficulties (e.g. when students cannot work successfully, when teachers cannot guarantee students encouraging environments, when parents can no longer help, etc.) (Čačinovič Vogrinčič, 1999; Davis, 2014). As emphasized by (Čačinovič Vogrinčič, 1999, p. 175), problems can only be solved when they are approached by all those involved.

At this level, school counsellors' work should incorporate a form of *consultation*, which means "[…] collaborating with 'the third party', with parents, teachers, school management and others whose primary concern is children's/students' well-being and who have an influence on children, and children's work and development are their main focus" (Resman 1999, pp. 70–71). This includes three people (counsellor – consultant, consultee and *counselee*) with two of them (counsellor – consultant and consultee – the teacher, parents) collaborating in order to help the third (*counselee* – the student) (Pečjak and Košir, 2012, p. 70). At the same time, the consultee should be helped to develop self-confidence and to acquire knowledge and skills to work with the *counselee* – the student (ibid., p. 71).

School counsellors will, namely, face problems which they cannot or are not authorized to solve by themselves. In such cases they may choose to or are forced to contact and cooperate with individuals and institutions in the community or outside the school environment (Davis, 2014; Resman 1999). On the other hand, experts from the community who work with students or their families outside schools may also turn to school counsellors for help, advice or consultation (ibid.).

Resman furthermore emphasizes that the school counselling service and external institutions collaborate as "[…] partners in problem-solving, in which they cannot do one without the other. There should be a rational division of tasks between internal and external forms of counselling and effective complementarity,

without anyone being subordinated to anyone else […]" (Resman 1999, p. 79).

The success and efficiency of collaboration will importantly depend, on both the levels, on how the school counselling service manages to present its role and tasks in schools to individuals and institutions in the community and, vice versa, how well they are acquainted with the roles and tasks of external institutions.

The institutions and individuals in the community with whom the school counselling service collaborates

According to Programme guidelines (Programske smernice, 2008, pp. 11–12), the school counselling service cooperates with experts from relevant external institutions in the area of providing assistance to individuals and groups and in the area of development and prevention activities relating to the school as a whole. The service collaborates with counselling centres, hospitals as well as other relevant health institutions and organizations, with social-work centres and other social-care institutions and organizations, with the National Education Institute of the Republic Slovenia, the Employment Service of the Republic of Slovenia, with universities, the Educational Research Institute and various other government and civil-society institutions, organizations and associations. The preschool counselling service is another external collaborator of the school counselling service, and vice versa (ibid., p. 12).

The school counselling service, thus, consults or collaborates with individuals and institutions from a variety of areas, such as education, social care, health care, etc. However, a special position is occupied by collaboration with parents, which is something we have discussed elsewhere (Kalin et al., 2009). It is important for the collaboration to be established already in preschools, when parents and the environment first begin to interact with educational institutions, in which participation and collaboration are of the utmost importance (Hočevar, Kovač Šebart, and Štefanc, 2013).

The initiative to collaborate may come from school counsellors or, as is often the case, from teachers working in schools, from students or parents. On the other hand, the initiative may come from individuals or external institutions themselves as they offer a specific programme or when they need collaboration with schools or school counsellors to be able to help a child or a family better.

Setting up and maintaining collaboration and relationships with individuals and institutions in the community is not (always) easy. It depends on a number of subjective and objective factors, both in schools and in the community and on their interaction. The more schools, individuals and institutions know and understand the characteristics (peculiarities) of one another and develop adequate attitudes towards collaboration, the more successful collaboration is likely to be.

1.2. The purpose of the research study

We studied the aspects of school counsellors' collaboration with institutions and individuals in the community in the empirical research study we conducted among primary-school counsellors in the autumn of 2014. We approached the issue in the context of providing help and from the aspect of collaboration referring to school/educational work as a whole. Out of a number of research questions, this article focuses on the following two:

1. How do the school counsellors evaluate collaboration with individuals and institutions in the community?
2. What positive and negative experiences have the school counsellors had of collaboration with individuals and institutions in the community?

2. MATERIALS AND METHODS

The descriptive and causal non-experimental method was used for the research (Sagadin, 1993).

All primary-schools in Slovenia (N = 453) were sent a link to the online questionnaire by e-mail in October 2014. The non-random sample thus consisted of 196 school counsellors working in Slovenian primary schools, of whom 189 (96.4%) were women and 7 (3.6%) were men. Their average age was 43 years, and their average length of service was 16 years. 91 of them (46.4%) worked in urban schools and 105 (53.6%) worked in non-urban schools. The largest share of the school counsellors in our sample was comprised of pedagogues (40.8%), almost a quarter were psychologists (24.0%), followed by social workers (18.9%) and social pedagogues (11.2%) and, with the smallest share,

special pedagogues (3.6%). Three respondents selected "Other", with two of them stating that they had degrees in both pedagogy and psychology.

Half of the counsellors were responsible for the central school and 43.4% of them were responsible for both the central school and its branch schools. 13 school counsellors selected "Other", eight of whom stated that in addition to their central school they also worked as counsellors in the preschool, and three stated that in addition to the central school they also worked in other schools to reach the full-time employment requirement. A little over a third of the counsellors stated that there was no one else beside them working in the school counselling service, and a little under two thirds of our respondents reported that their school counselling service employed more people.

The questionnaire consisted of evaluation scales with a high degree of reliability, which was tested with the method of internal consistency (Cronbach's coefficient α was $\alpha \geq 0.9$ for all the values). In all the scales the first factor explained more than the presupposed minimum validity requirement of 20%. The questionnaire also included three open questions and two combined questions. In two questions the respondents were asked to rank the given values. The counsellors completed the questionnaire via online application. The data were processed with the SPSS 22.0 software package. The descriptive analysis of variables was used. The open-question answers were divided into categories according to their content similarities.

3. RESULTS AND DISCUSIONS

The evaluation of collaboration with different institutions in the community

The research shows that the school counsellors collaborated with parents, other primary and secondary schools, preschools, boarding schools and social-work centres the most frequently (on a weekly or monthly basis). The largest share of our respondents collaborated monthly or a couple of times a year with the National Education Institute of the Republic of Slovenia, counselling centres and hospitals. A couple of times a year and on special occasions they collaborated with the Employment Service of the Republic of Slovenia, the Career Centre, the Ministry of Education, Science and Sport, universities, volunteers' associations, the police, specialized institutions for people with special needs and working organizations. On special occasion they also collaborated with other institutions working in the area of education, such as the Educational Research Institute, the Slovenian Institute for Adult Education, the Institute of the Republic of Slovenia for Vocational Education and Training, etc. In the "Other" category the school counsellors listed collaboration with the church or priests, old people's homes, OAP associations, humanitarian organizations, various associations, school inspection and the municipality. These results confirm that school counsellors collaborate with a variety of institutions in the community (cf. Vogrinc and Krek, 2012). Nevertheless, it is to be expected that due to the tasks of the school counselling service school counsellors collaborate with parents the most frequently.

The responding school counsellors evaluated collaboration with external institutions on the following scale: 1 – very poor, 2 – poor, 3 – good, 4 – very good, 5 – n/a.

Table 1. The school counsellors' evaluation of collaboration with institutions in the community

The school counsellors' evaluation of collaboration with institutions in the community		very poor	poor	good	very good	n/a	total
Employment Service of the Republic of Slovenia, Career Centre	f	5	8	104	56	17	190
	f%	2.6	4.2	**54.7**	29.5	8.9	100.0
National Education Institute of the Republic of Slovenia	f	/	4	112	65	8	189
	f%	/	2.1	**59.3**	34.4	4.2	100.0
Ministry of Education, Science and Sport	f	3	20	118	22	26	189
	f%	1.6	10.6	**62.4**	11.6	13.8	100.0
Educational Research Institute, Institute for Adult Education, Institute for Vocational Education and Training, etc.	f	2	10	72	16	89	189
	f%	1.1	5.3	**38.1**	8.5	**47.1**	100.0
Social-work centre	f	/	23	104	58	3	188
	f%	/	12.2	**55.3**	30.9	1.9	100.0
Counselling centres	f	2	9	86	69	23	189
	f%	1.1	4.8	**45.5**	36.5	12.2	100.0
Hospitals (local hospitals, Clinical Centre, Paediatric Clinic, etc.)	f	/	5	82	99	4	190
	f%	/	2.6	43.2	**52.1**	2.1	100.0
Other schools (primary, secondary schools), preschools, boarding schools	f	/	1	46	142	1	190
	f%	/	0.5	24.2	**74.7**	0.5	100.0
Universities	f	3	17	63	19	86	188
	f%	1.6	9.0	33.5	10.1	**45.7**	100.0
Volunteers' associations, e.g. in the area of prevention, sport, cultural activities, etc.	f	1	4	73	85	26	189
	f%	0.5	2.1	38.6	**45.0**	13.8	100.0
Parents	f	/	1	81	105	2	189
	f%	/	0.5	42.9	**55.6**	1.1	100.0
The police	f	/	1	93	86	10	190
	f%	/	0.5	**48.9**	45.3	5.3	100.0
Specialized institutions providing help to children/students with special needs	f	/	5	93	63	28	189
	f%	/	2.6	**49.2**	33.3	14.8	100.0
Working organizations	f	4	6	71	31	69	181
	f%	2.2	3.3	**39.2**	17.1	38.1	100.0
Other	f	2	/	3	3	9	17
	f%	11.8	/	17.6	17.6	**52.9**	100.0

According to our findings, we can assert that the school counsellors were relatively satisfied with their collaboration with different community institutions, since the majority deemed it to be either good or very good. The counsellors evaluated collaboration with other schools, preschools and boarding schools as the best. They hardly ever said collaboration with external institutions was very poor, though some did evaluate it as poor.

The evaluation results suggest an encouraging conclusion, and satisfaction with the existing collaboration certainly provides good bases for further collaboration. It is important for school counsellors to feel that external institutions and individuals are on their side and that they can cooperate with them successfully, as this will make it easier to coordinate the goals and manners of collaboration both at the level of educational work as a whole and at the level of helping students or families with difficulties. The evaluations suggest that the great majority of the school counsellors had had good experiences of collaboration, which is also confirmed by their descriptions presented below.

Descriptions of (positive and negative) experiences that the school counsellors had of collaboration with individuals and institutions in the community

An important aspect of collaboration between school counsellors and individuals or institutions in the community is, certainly, an analysis of past experiences and collaboration. Such analysis enables counsellors to assess the (lack of) success in previous work and collaboration. Therefore, we asked the counsellors to provide an example of *a positive and a negative experience of collaboration*, which gave us valuable insights into the evaluations provided above.

Such descriptions were provided by 125 school counsellors. We distributed the responses in the following categories (the shares of individual categories are given with reference to the total number of responses concerning a positive experience):

1. *The range of various and varied activities provided by schools/school counsellors in collaboration with individuals and institutions in the community* (79.2%): the counsellors

listed a number of very different and heterogeneous activities, programmes and projects that schools or school counsellors carried out in collaboration with individuals and institutions in the community. We note that these include *activities of providing assistance* in the context of which school counsellors provide help – through interinstitutional work and collaboration with external institutions and experts – to children (students) or groups of children (students) and parents or families with various problems. At the same these include *activities in schools intended for all* students, teachers, parents and/or individuals and institutions in the community: for instance, career orientation, prevention activities, sport, culture, nature, technology and health activities, intergenerational integration, educational activities, etc. Regarding the *activities in schools intended for all students*, the school counsellors most frequently reported career orientation and prevention activities (e.g. in the fields of violence, human trafficking, online safety, use and abuse of drugs, smoking, sexuality, etc.).

2. *A positive experience of individual institutions and individuals in the community* (68%): the school counsellors highlighted different institutions or individuals in the community that they had had positive experiences of collaboration with – associations and volunteers' organizations providing prevention activities, sport and culture activities, etc.; other primary and secondary schools; social-work and crisis centres; hospitals, counselling centres; the police; and numerous other individuals and institutions in the community. Moreover, the respondents emphasized the role of the school counselling service in such collaboration: they believe that within each school the counselling service is the one who collaborates with external services the most.

3. *Collaboration or activities intended for a specific group of students, parents or families, teachers or individuals in the community* (62.4%): the counsellors mainly stressed *individual students or groups of students* who participated in specific activities, programmes or projects. Often, the activities included all students, but the respondents emphasized students with different problems (e.g. emotional, learning, behaviour, etc.), socially underprivileged students and students from poorer social-economic backgrounds, students with special needs, talented students, students who were victims of family violence, students with long-term illnesses, immigrant students and Romani students. This category of responses also includes those in which the school counsellors stressed positive experiences of institutions or individuals in the community when the latter provided teachers and school counsellors with training during (regular weekly) expert meetings covering different issues. The counsellors also mentioned positive experiences that related to providing assistance to *parents or families*. Finally, we added the examples in which schools carried out activities which contributed to the life and work of *individuals or institutions in the community*.

4. *Positive aspects, benefits, effects and outcomes of good-quality collaboration and joint work* (37.6%): this category includes the responses in which the school counsellors described positive aspects, effects and outcomes of good-quality collaboration on both sides: for schools or students on one side and for external institutions or individuals on the other side. The school counsellors saw benefits for *all participants* in collaboration in the exchange and constructive confrontation of different opinions; in gaining experience and new information and knowledge about specific issues from different experts; in greater expertise or better-quality professional work; in faster, more efficient and more in-depth collaborative problem-solving; in co-creation; in socializing; in expanding social networks, etc. They named the following among benefits to *students and parents*: care for the child' well-being, support for the students, active spending of free time, support for parents, etc.

5. *Teamwork – jointly planning, conducting and evaluating projects and activities – and interinstitutional networks* (28%): the counsellors underlined the importance and efficiency of teamwork in specific one-off activities or yearly projects or programmes. They emphasized that without the help of external institutions or individuals, without teamwork and interinstitutional networks they would not have been able to carry out certain activities or projects and solve students' and families' problems. In certain activities or projects schools, parents and a number of external institutions can collaborate at the same time. Furthermore, the counsellors emphasized the importance of teamwork and interinstitutional networks comprising various external institutions. They stated that certain problems that students or families encountered could only be solved with the help and good-quality participation of external institutions or individuals.

6. *The conditions for good-quality collaboration with institutions or individuals from the community* (12%): the counsellors

stressed that good-quality collaboration between schools and institutions or individuals in the community required positive attitudes and specific communicative, organizational and cooperative skills and knowledge.

As can be seen, the counsellors listed among positive experiences both the collaboration with institutions and individuals in the community which refers to counselling and consultation work when helping students or families as well as the collaboration concerning the work of schools (i.e. educational work as a whole) when acting at the level of the school, for instance in career orientation, cultural, sport activities, etc.

Next, we analysed the responses of the responding school counsellors who had gaven a description of *a negative experience* (n = 105). We distributed the descriptions in the following categories (here, also, the shares of individual categories are given with reference to the total number of responses concerning a negative experience):

1. *Unresponsiveness of external institutions or individuals, rigidity when solving students' or families' problems* (25.7%): the responding counsellors stated that external institutions or individuals did not always respond, and they sometimes responded slowly, without interest, desire or engagement to the counsellors' interventions and reporting of problems with students or families. In some cases the counsellors complained about the collaboration in general. Solving students' or families' problems was sometimes slow, rigid, time-consuming, and sometimes the problems were not solved at all. Problem-solving was also not done in multi- or interdisciplinary teams, sometimes the collaboration was merely professed and without active participation. Another problem was the limited authority of certain institutions, which resulted in laying responsibility and blame for the solution of students' or families' problems from one institution onto another. A further problem was the constant fluctuation of staff in some institutions.

2. *A lack of time and resources for collaboration* (21.9%): the counsellors maintained that they as well as experts from external institutions frequently lacked sufficient time for collaboration, that they were overloaded with other responsibilities, and that they were pressed for time and found it hard to agree on schedules. Additional responsibilities brought about burnout, great expectations led to hurry, exhaustion, etc. There was also a lack of financial and material resources, which disabled carrying out individual or joint projects. The counsellors had also had negative experience of excessive paperwork needed for collaboration.

3. *Inadequate information exchange and communication* (17.1%): some of the counsellors reported rarely or never receiving feedback from external institutions or individuals about a student or family they worked with. They also said that contacts with external institutions or individuals were not always two-way communication – counsellors had to draw up a number of reports, etc., but they received no guidelines or information about the students or families from external institutions or individuals. Finally, the counsellors reported differing views on situations and solutions to problems.

4. *Unprofessional conduct and inappropriate attitudes of external institutions or individuals in the community* (15.2%): the counsellors reported occasional unprofessional conduct when solving students' or families' problems, especially relating to confidential information "leaks", giving information to third parties, etc. Some of the counsellors' own safety was jeopardized because of the unprofessional conduct of another institution (counsellors receive no protection in case of danger). The responding counsellors also referred to the superior and arrogant manner and negative attitudes of some individuals or institutions in the community towards schools or individual teachers or school counsellors.

5. *Negative experiences of (not) completing agreed activities* (5.7%): individuals or institutions in the community did not finish the activities in schools that had been agreed on, they did not excuse their absences, they imposed limits or demands on schools, their work was not relevant or they were not sufficiently well-prepared.

6. *Problems in collaboration with parents* (4.8%): this category includes the replies by the responding counsellors that emphasized the negative experiences of working with parents, grandparents or families when addressing students' problems. It also includes the responses which reveal situations in which parents or families no longer wanted to be in contact with the school counsellors after the latter had informed external institutions of a certain issue.

When looking at negative experiences, we can start by assessing as positive the fact that almost a third of the respondents (24.8%) reported not having or not remembering any problems when collaborating with external

institutions or individuals. This is doubtlessly a good starting point for further, good-quality collaboration.

However, when describing negative experiences, the counsellors stressed certain factors which posed obstacles to good-quality collaboration between schools or the school counselling services and the community. They emphasized a lack of time, material and financial resources and excessive bureaucracy, which confirms the findings made by previous evaluations of the school counselling service (Bezić, 2008; Razvoj in spremljanje delovanja mreže svetovalnih služb (Poročilo o RA projektu), 2007). A decrease in certain (administrative) tasks, on the one hand, and adequate conditions and resources (including the legislative level) for collaboration, on the other, would certainly improve collaboration. It seems even more important to ask whether collaboration can be successful if school workers and experts from external institutions are not motivated, if they do not establish good-quality relationships, and if they do not have the competencies required for such collaboration. Here we are faced with the collaboration obstacles and drawbacks that the school counsellors emphasized in our research study: unresponsiveness, inadequate information exchange and communication and unprofessional conduct. It should be emphasized that – in the wish for good-quality collaboration – some fundamental conditions should be guaranteed, which the responding counsellors drew attention to in their descriptions of positive experiences: collaboration participants should develop interpersonal, communicative, cooperative and organizational skills.

4. CONCLUSIONS

Our research findings confirm that the school counselling service has an important role in developing the network of collaboration with various individuals and institutions in the community, for example with other schools, preschools, governmental and non-governmental organizations and associations, with cultural and sport institutions, etc. Such networks enable the school counselling service to encourage, promote, develop and coordinate the collaboration activities that bring schools, communities and families together. These are three closely interconnected contexts, affecting each child's development (Epstein, 1995). Together, they can support children's (students') healthy, holistic development.

From the perspective of the three contexts it is important for collaboration between schools and the community (the collaboration program) to reflect individuality, to be unique and special for each individual school, and to take account of the community's characteristics. In addition to the structural aspect of collaboration, *the relational aspect* ought to be foregrounded: how collaboration and interpersonal relationships are established and what their quality is (Sheridan et al., 2002).

The significance of teamwork should also be stressed (i.e. meaning jointly planning, conducting and evaluating activities), which the counsellors participating in our study explicitly highlighted. This alerts us to the need for the conditions for collaboration, teamwork and problems solving – involving teachers, parents, external institutions and individuals – to be established in schools and in external institutions. This will allow for good-quality educational work in general and with all students.

It is important for both school counsellors and individuals/institutions in the community to establish mutual trust and to encourage the culture of dialogue, listening, agreeing on goals and collaborative tasks, as well as to respect the competencies of all participants. It is also desirable that school counsellors openly evaluate their work or existing ways of establishing and maintaining contacts, relationships and collaboration with individuals and institutions in the community, and use the evaluation to improve, complement or modify their collaboration.

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Conflict of interests

Authors declare no conflict of interest.

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NON-FORMAL EDUCATION WITHIN THE FUNCTION OF RESPONSIBLE PARENTING

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ABSTRACT

The aim of this survey was to discover to what degree parental non-formal education is present within the function of responsible parenting. The questionnaire research method was used in the survey. For the purpose of this research a questionnaire of 13 questions was constructed relating to the forms of non-formal education, and another questionnaire of 10 questions relating to the parents' expectations of non-formal education. The sample included 198 parents. Examination of the scores concerning the presence of certain forms of parental non-formal education realized in cooperation with the school leads to the conclusion that the parents possess a positive attitude towards non-formal education. The analysis showed that the parents' expectations were not on a satisfactory level. According to the results, the fathers displayed a greater interest towards non-formal education (7.72±1.35) than the mothers (6.93±1.85), ($p<0.05$). Unemployed parents had a greater score (7.85±1.30) than the employed parents (7.22±1.71), ($p<0.05$). A difference in the acceptance of non-formal education in accordance with the level of formal education was also noticeable ($p<0.001$). Respondents with a high school degree displayed the highest level of acceptance (7.97±0.78), while the lowest interest was seen in respondents with an associate degree (6.41±2.29). Univariate linear regression analysis showed that statistically important predictors were: gender (OR: -0.23 (-1.24 – -0.33), $p< 0.001$), work status (OR: -0.14 (-1.24 – -0.01), < 0.05) and the level of formal education (OR: -0.33 (-0.81 – -0.34), $p< 0.001$). The final results lead to the conclusion that parental non-formal education supports the concept of lifelong education.

1. INTRODUCTION

A child's life begins with the family where certain relations have already been established by the parents taking up the role of educators. Therefore, a corpus of activities which represent certain elements of parenting can be recognized in the process of family upbringing. In the last couple of years special attention has been paid to the key elements of parenting. Therefore »one should start from the assumption that a person's abilities for the role of a spouse, as well as one's skills for the role of a parent is not an exclusive right of any social class, nor is it in direct link with the cultural level of the concerning sides« (Pati, L., 1999, 163).

A child's education had been the parents' responsibility in every historical epoch. However, the manner in which educational function was applied by the parents had been changing in the way aims which the parents laid down for themselves were changing, in the way educational attitudes were changing as well as parental educational styles. Family educational perspective must be focused towards the activation of existing family resources where the parents are competent to independently establish a parental style whose characteristics are »conceptualized rationalities: the aim is to support an integrated as well as integrating perspective which includes co-

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ordination and establishment of disciplinary knowledge that in turn would affect different dimensions of the family altogether as well as the multitude of dimensions of the problem. It is a perspective that takes into account the context of family life, not only life inside the family circle, a perspective which establishes implicit educational theories which every family risks implementing in order to clarify them and make them evident, a perception which would function in a contemplative environment and ambiance of established rationality, constantly searching for something which may be called »invisible knowledge« with the aim of improving the processes that focus on the intent of conscious action and not only on automatic action« (Milani, 2002, 19). Specifically, parents should realize that it is important to understand and experience child education within a family as an essential experience that incorporates a personal character and certain social discourses. Therefore, it includes »assisted normality which essentially means to educate, to educate in the style of mutual knowledge exchange, trust, cooperation and various efforts against the transfer of one's own responsibilities on others, it means establishing unified action plans against the all-powerful ways of the institution which acts on its own, it means action within the circle of partnership logic, within the context of intersubjectivity with the aim of making people aware of the importance of accountability of various actors, which enables, above all, the way of improvement and independence of the family« (Milani, 2002, 20).

It is necessary to point out that the parents' education »is different from other forms of action in the sense that it is addressed to the public without exceptions. It relates to all the answers, activities, abilities that are even in the slightest relation to education. Also, it's intention differs from other approaches: it doesn't aim to achieve an explicit behavioral change or some already defined and existing structures, but it tries to expend the competencies and educational abilities of all the members of the community« (Pourtois, Forgione, Desmet, 1989, 265). Therefore, in order for it to be an essential support for parents, it is important for it to »happen on account of the parental pair's resources, and in this way their parental capacity is growing. Because of it, parental education for the educational role represents the means for strengthening the family's individuality and abilities and supporting them, acknowledging present resources within the family nucleus« (Simeone, 2012, 175).

Programs dealing with parental education for the process of parenting are intended to provide parental assistance in order to ease their insecurity with their parental role and therefore contribute to the creation of healthy relationships between parents and children.

Parental education programs have to be based on a thorough analyses of a family as a system and also of the social context, because »entering into someone else's life, home, in his everyday routines, family relationships, and therefore, often into the interior of one's unpleasant and painful experience, demands a great ability of mobility regulation, words, silence, presence and absence, but also that regulation can often contain within itself a dose of suffering and assistance in the developing phase« (Janssen, 2005, 9).

Knowledge and education represent strategic development factors of society. Education in general, especially non-formal education is in a serious crisis and in stagnation in our country.

General expansion of non-formal education and its successful connection with formal and permanent education represents a new kind of development quality of overall pedagogical theory and practice. Therefore, permanent education is becoming a strategic development factor of every society. Its basic objective is to explore the most effective ways, methods and forms of acquiring knowledge from birth until the end of human life.

Formal, non-formal and informal education present a unique, complex process (Figure 1).

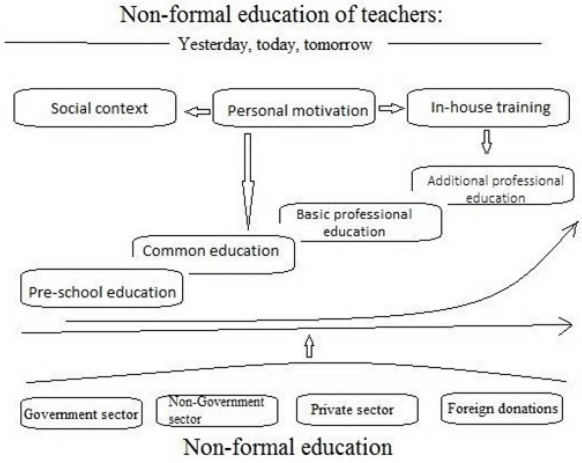

Figure 1. Non-formal education as a segment of lifelong education

Therefore, lifelong education comprises of segments which complement each other. Thus, inclusion of an individual into various phases of education is possible (Protasevich,

2011, 75-76). An individual can during his lifetime create his own educational path which depends on the social context (Повседневный социум) and personal motivation (Личная мотивация). With the aim of improving knowledge, skills and abilities, non-formal education represents a part of the educational system which can be organized by the government (Государственный), non-government sector (Негосударственный), private sector (Частный) and from foreign donations (Зарубежные провайдеры).

It is important to point out the components of non-formal education (Figure 2). The components of non-formal education are: communication (Общение), the subject of communication (Предмет общения), motives of communication (Коммуникативные мотивы), communicational action (Действия общения), the need for communication (Потребность в общении), communicational tasks (Задачи общения), communicational means (Средства общения), products of communication (Продукты общения) and the aim of communication (Цель).

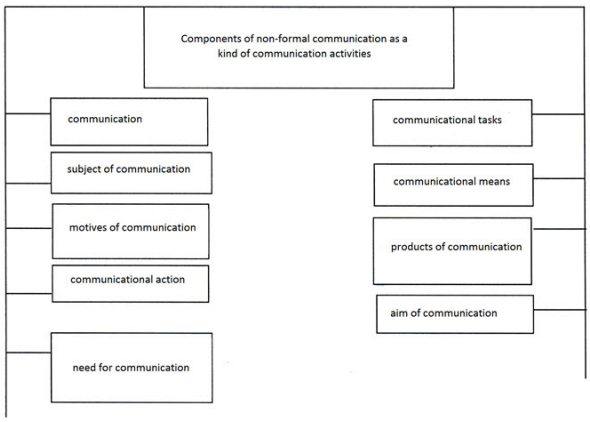

Figure 2. Components of non-formal communication

The above mentioned components can be understood as a way of communicative action. Depending on the organization of non-formal education there exist three types of communication: macro level communication (communication doesn't appear as an activity but as a form of interaction between people involved in various activities in a social context), mezo level communication (professional contacts), and micro level communication (the basic unit of communication) (Lomov, B. F., 1979, 34-47).

Refining one's own personality is a primary objective of every individual. The increasing complexity of modern family structure as well as the ever growing responsibilities it implies, demands a certain level of education and self-education. A well-known fact of the present is that systematic preparation for family life is rather neglected. In this regard, everything that has been neglected in the institutional education system needs to be achieved and compensated by means of self-education. Complete knowledge of family and family interactions, elasticity in family relations toward its members and creativity in the process of establishing a positive family atmosphere are important aims of this type of self-education.

Adult education as a preparation for responsible parenting should begin during regular education of young people. It should constantly be updated with certain contents depending on the age and needs.

Within the field of child education, parents go to great lengths led by wishes, intentions and endless effort. However, successes are not always complete, noble wishes are not fulfilled and parents' efforts are met with the latest challenges of educational action. The results of children's family upbringing are dependent upon many factors: social, material, health, educational etc.

The parents' level of education, their culture and pedagogical education assuredly represent important factors in achieving children's educational results. Most parents lack the knowledge of treating their children in a pedagogically correct way and also which educational methods should be applied to child education; some do not understand a child's psychological and physical development as well as certain phases of its development and therefore don't conform their educational actions towards the child; others, in a conscious or unconscious way, make mistakes in their child's upbringing possibly because of their educational and parental weaknesses: showing feelings excessively, being emotionally stingy in terms of love, showing nervousness.

A systematically conceived program involving parents began in the fifties: seminars, courses, "schools for life", parent centers, counseling clinics (pedagogical, psychological - pedagogical, pedagogical – medical, etc.). The work with parents was conducted on account of special programs, sessions and discussions involving psychologists, pedagogues, pediatricians, defectologists, lawyers, judges and others.

The aim was to make parents aware of the latest scientific discoveries in the field of child development and their upbringing, of the conditions that should provide the family with

a positive development, to make them aware of the modern family relations, with equal relationships in society as well as in the family. All the efforts were aimed at making parents more active in the process of child education and upbringing.

A significant role was played by schools for parents which provided systematic and extensive knowledge which were directed at various aspects of family life: pedagogical, psychological, family upbringing, legal basis of a marriage and family, social protection.

Parent clubs (often parts of institutions, schools) were also very successful. They organized: lectures, music programs, discussions and other activities.

"Schools for life" were meant for young people and were organized as parts of workers' or people's universities. These schools had two levels:

- For young people age 15 – 17: the aim of the program was forming a young personality and its character, relationships between the sexes, behavior of young people;
- The second level dealt with topics relating to the preparation for marriage, the choice of a spouse, a child's position within a family.

Apart from programs for parents papers, magazines, brochures and other publications for families and parents were issued with the aim of widening the range and making necessary knowledge about children and family relationships available for a great number of parents.

While schools and parent centers, seminars, pedagogical evenings, courses primarily had an educative character, counseling clinics dealt with parents and their children when the first hardships and problems occurred.

Many of these work and assistance forms are present today, with slightly different contents of course, and some have even been developed into special social institutions. In this way marriage and family counseling centers were formed and various programs of non-formal parental education within and outside the school context were developed.

When talking about non-formal parental education, a school is mostly focused on:

- Pedagogical and psychological parental education involving psychologists, pedagogues, teachers, doctors...
- The participation of parents in various school bodies (parent council, school board, committees, teams) which can influence the educational work of a school and its teachers.

Non-formal parental education can have an influence on the quality of interaction between a family and the school context. It is interesting to approach the problem from the perspective of Bronfenbrenner's (Urie Bronfenbrenner) ecological development theory which denotes a constant personality development through continuous exchange of influences between natural coexisting ecological subsystems in a unique field of life. Proximal and distal processes appear in this framework. The center of this model is the child (Feinstein, Duckworth and Sabates, 2008, 25).

Interaction between a family and school is present on various levels (Figure 3). Hence, parents working on their education from the field of responsible parenting can certainly make better judgements about the quality of many fields which is certainly in the school's interest.

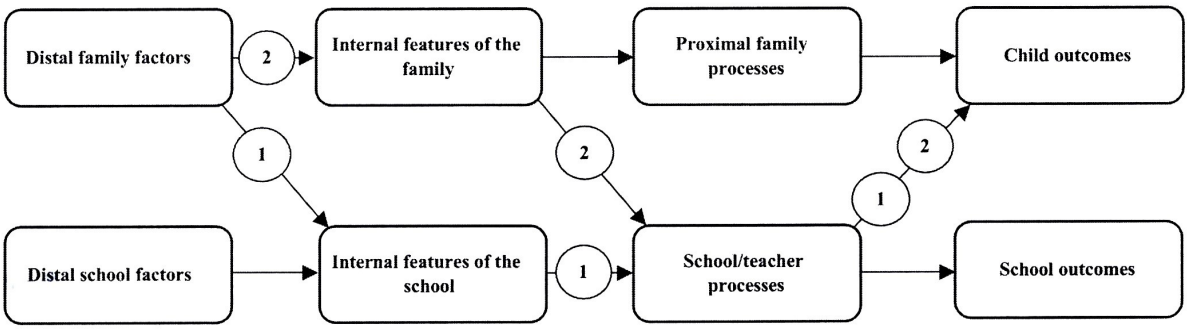

Figure 3. Conceptual model for multi-level interactions between family and school

Distal family factors influence internal characteristics of a school – they influence the objectives indirectly through the teaching process (arrow 1), but also school characteristics through another channel (resources, ethos) over attitudes and beliefs that the teachers represent (arrow 2). For example, the teachers can have higher expectancies of children whose parents are educated, or wealthy, which influences the teacher-child interaction char-

acteristics, and yet those parents can become more proficient, skilled in the art of interaction with teachers, as well as support the school's objective (Feinstein, Duckworth and Sabates, 2008, 121-122).

In order to provide quality work on modalities of non-formal education it is necessary to bear in mind parental cognitions which are not isolated.

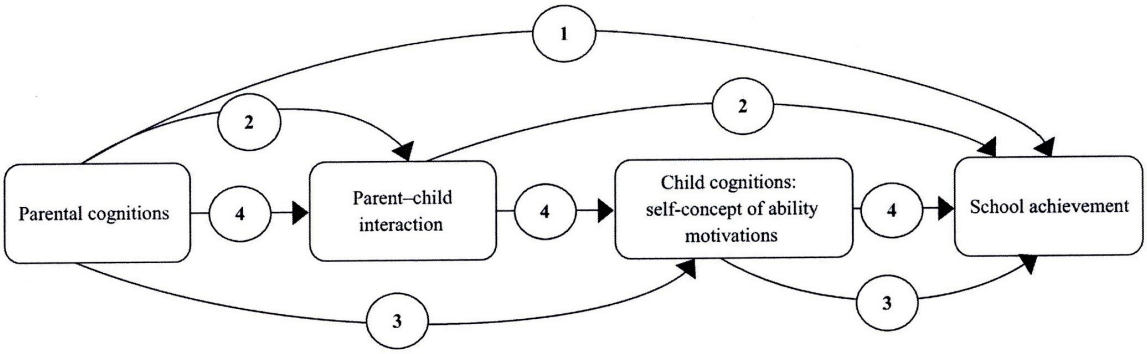

Figure 4. Some hypothesised direct and indirect influences of parental cognitions

Parental cognitions are dynamic and can have various outcomes within the parent-child interaction, child cognitions, with distal family factors and distal school factors. Possible outcomes which are not mutually exclusive in the field of family context or on a broader term, social context are displayed graphically (Figure 4) (Feinstein, Duckworth and Sabates, 2008, 78-79).

2. MATERIALS AND METHODS

The objective of this survey was to discover to what degree parental non-formal education is present within the function of responsible parenting. The objectives of this survey were:

- To determine the presence of certain forms of parental non-formal education;
- To examine parental expectations of non-formal education;
- To determine the level of acceptance of parental non-formal education compared to socio-demographic variables;
- To examine the predictions of parental non-formal education.

It is assumed that forms of parental non-formal education (forms which were organized by schools and those organized outside the school context) are different in terms of functions within responsible parenting. The following sub-hypotheses are posed:

h1 It is expected that the most prevalent forms of parental non-formal education would be the forms organized by schools;

h2 Parent's expectations of non-formal education will be dominant with the aim of facilitating their child's involvement in school life;

h3 It is expected that mothers would to a greater degree accept non-formal education as opposed to fathers, that unemployed parents would to a greater degree accept non-formal education than the employed parents and parents with the highest educational level would be most likely to accept non-formal education;

h4 It is expected that the predictors of non-formal parental education would be: gender, work status and the level of formal education.

The questionnaire research method was used in the survey. For the purpose of this research a questionnaire was constructed consisting of 13 questions which relate to the forms of non-formal education, and another questionnaire consisting of 10 questions about the parents' expectations of non-formal education. The survey was conducted during the months of March and April 2017.

The sample included 198 parents of elementary school pupils from the Bor municipality. Table 1 displays the sample structure, for the sake of viewing, according to the socio-demographic variables: gender, work status and the level of formal education.

Table 1. Sample demographic characteristics

	N=198
Gender, n (%)	
male	99 (50.0%)
female	99 (50.0%)
Work status, n (%)	
unemployed	34 (17.2%)
employed	164 (82.8%)
Level of formal education, n (%)	
Elementary school degree	10 (5.1%)
High school degree	98 (49.5%)
Associate degree	43 (21.7%)
University degree	41 (20.7%)
Master degree or Ph.D.	6 (3.0%)

The sample is completely homogenous in terms of gender. Most of the respondents are employed (82.8%). The sample structure in terms of formal education consists of 5.1% of the respondents with an elementary school degree, 49.5% of the respondents possess a high school degree, 21.7% possess an associate degree, 20.7% possess a university degree, while only 3% possess a master degree or a Ph.D.

In the analysis of parental non-formal education, the following statistical methods were used: the arithmetic mean with the corresponding standard variation form the descriptive statistics measures, and frequencies and percentages were used for the display of qualitative variables. The differences between groups were determined by One-way variance analysis (ANOVA). The Student t test was used for large independent samples.

Variables that proved as statistically important in the pre-analysis were entered into the univariate regression linear model. Those that were statistically important in this model in explaining the dependent variable were entered into the multivariate model. Therefore, for the purpose of prediction univariate and multivariate linear regressions were used.

Statistical significance was defined at the level of probability of the null hypothesis at $p \leq 0.05$. Statistical processing and analysis was done in the computer program SPSS ver. 21 (Statistical Package for the Social Sciences).

3. RESULTS

Table 2 displays the percentage distribution of the parents' answers to questions relating to the forms of non-formal education within the schools the parents participated in.

Table 2. The forms non-formal education within schools in which the parents participated the most, descriptive indicators

		N=198
Parent-teacher meeting (%)	no (%) / yes	13 (6.6%) / 185 (93.4%)
Lectures for parents	no (%) / yes (%)	130 (65.7%) / 68 (34.3%)
Planned individual counselling	no (%) / yes (%)	150 (75.8%) / 48 (24.2%)
Individual counseling on the parents' initiative	no (%) / yes (%)	131 66.2 (%) / 67 (33.8%)
Individual counseling on the head teacher's initiative	no (%) / yes (%)	151 (76.3%) / 47 (23.7%)
Activities in the parent council	no (%) / yes (%)	174 (87.9%) / 24 (12.1%)
Performing certain tasks at school	no (%) / yes (%)	184 (92.9%) / 14 (7.1%)
Written communication with the head teacher	no (%) / yes (%)	181 (91.4%) / 17 (8.6%)
Written inquiry	no (%) / yes (%)	183 (92.4%) / 15 (7.6%)
Consulting the school psychologist/pedagogue	no (%) / yes (%)	163 (82.3%) / 35 (17.7%)
Non-formal education score,	*minimum – maximum (mean±SD)*	*2 - 9 (7.33±1.66)*
Do you educate yourself regularly on the topic of parental education on family life and child upbringing?	regularly(%) / sometimes(%) / never(%)	33(16.7%) / 124(62.6%) /41(20.7%)
Have you ever attended a counseling session for parents or talked to a specialist about your child's upbringing?	regularly(%) / sometimes(%) / never(%)	18(9.1%) / 51(25.8%) / 129 (65.2%)
Have you ever been a student of a school for parents?	regularly(%) / sometimes(%) / never(%)	20(10.1%) / 10(5.1%) / 168 (84.8%)

The greatest percentage of parents attended parent-teacher meetings with 93.4%, a notable percentage of parental attendance on lectures for parents was observed at 34.3% and individual counseling on the parents' initiative at 33.8%. Next on the list were other forms of parental non-formal education which were present in a lesser degree: consulting the school pedagogue with 17.7%, planned individual counseling with 24.2%, individual counseling on the head teacher's initiative with 23.7%, activities in the parent council with 12.1%, written communication with the head teacher with 7.6% and performing certain tasks at school with 7.1%.

The end score of non-formal education was calculated in accordance with the above mentioned items. The score theoretically scales between 0 and 10 because it represents the set of positive answers on questions explaining non-formal education. However, the end scores range from 2 to 9, and the achieved average of a sample is 7.33±1.66.

The respondents' task was to answer three additional questions about non-formal education, and the results show that 16.7% of parents educate themselves regularly on the topic of parental education on family life and child upbringing, 9.1% attend a counseling session for parents or talk to a specialist about their child's upbringing, while 10.1% of all parents were students at a school for parents.

Table 3 displays the scores depicting the parents' expectations of non-formal education.

Table 3. Parents' expectation of non-formal education, descriptive indicators

		N=198
To facilitate their child's involvement in school life	no (%) / yes (%)	81 (40.9%) / 117 (59.1%)
To appease teachers	no (%) / yes (%)	195 (98.5%) / 3 (1.5%)
To assist the school in child upbringing	no (%) / yes (%)	155 (78.3%) / 43 (21.7%)
To unify their demands of the child with he views and demands of the school	no (%) /yes (%)	122 (61.6%) / 76 (38.4%)
To provide the most favorable conditions for child development through parent-teacher coordinated actions	no (%) / yes (%)	42 (21.2 %) / 156 (78.8%)
To educate themselves on the appropriate actions applicable in education	no (%) / yes (%)	151 (76.3%) / 47 (23.7%)
To assist the school in various tasks	no (%) / yes (%)	178 (89.9%) / 20 (10.1%)
Doesn't expect anything, the parent is involved pro forma	no (%) / yes (%)	196 (99.0%) / 2 (1.0%)
Doesn't expect anything and isn't involved	no (%) / yes (%)	197 (99.5%) / 1 (0.5%)
Expects something else	no (%) / yes (%)	198 (0%) / 0 (0%)

The greatest percentage of parents said that their greatest expectation of non-formal education is to provide the most favorable conditions for child development through parentteacher coordinated actions 78.8%, a large percentage wants to facilitate their child's involvement in school life 59.1%, as well as to unify their demands of the child with he views and demands of the school 38.4%. The percentage of parents who wants to educate themselves on the appropriate actions applicable in education approximates at 23.7 %, to assist the school in child upbringing expect 21.7% of the parents, while only 10.1% of the parents expect to assist the school in various tasks. An insignificant percentage of the parents expects: to appease teachers 1.5%, doesn't expect anything, the parent is involved pro forma 1.0%, doesn't expect anything and isn't involved 0.5%.

We also studied whether there is a difference in degree of acceptance of non-formal education according to the socio-demographic variables. The results are displayed in Table 4.

Table 4. Non-formal education score depending on socio-demographic variables

	Non-formal education score	p
Gender		
male	7.72±1.35	**<0,05**[a]
female	6.93±1.85	
Work status		
unemployed	7.85±1.30	**<0,05**[a]
employed	7.22±1.71	
Level of formal education		
Elementary school degree	7.80±0.91	**<0,001**[b]
High school degree	7.97±0.78	
Associate degree	6.41±2.29	
University degree	6.73±1.92	
Master degree or Ph.D.	6.66±1.75	

aStudent's t – test; bANOVA test; p- statistical significance;

Note: mean±standard deviation are shown in table

The results show that males (fathers) are more likely to accept non-formal education (7.72±1.35) than females (mothers) (6.93±1.85), ($p<0.05$). Unemployed parents have a greater score on non-formal education (7.85±1.30) than employed parents (7.22±1.71), ($p<0.05$). There is also the difference in the acceptance of non-formal education in accordance with the level of formal education ($p<0.001$). Respondents with a high school degree have the highest level of acceptance of non-formal education (7.97±0.78), while the lowest interest is seen in respondents with an associate degree (6.41±2.29). If we examine average percentages, we can observe that respondents with lower level degrees of formal education (elementary school and high school) have higher scores in non-formal education, i.e. display a higher level of interest towards non-formal education than those with higher levels of education.

After testing the differences, the variables that proved to be statistically important were entered at first in the universal regression model, and depending on the significance in this model, they were also entered in the multivariate regression model. Results are displayed in Table 5.

Table 5. Prediction of non-formal education

Independent variables	Univariate linear regression analysis			Multivariate linear regression analysis		
	OR (95%CI)	p	Adjusted R Square	OR (95% CI)	p	Adjusted R Square
Gender	-0.23 (-1.24 – -0.33)	**< 0.001**	0.05	-0.27 (-1.33 – -0.48)	**< 0.001**	0.18
Work status	-0.14 (-1.24 – -0.01)	**< 0.05**	0.02	-0.07(-0.91 – 0.25)	0.266	
Level of formal education	-0.33 (-0.81 – -0.34)	**< 0.001**	0.11	-0.33 (-0.81 – -0.35)	**< 0.001**	

OR-odds ratio, p - statistical significance;

Univariate linear regression analysis shows that statistically important predictors of the level of acceptance of non-formal education are: gender (OR: -0.23 (-1.24 – -0.33), p< 0.001), work status (OR: -0.14 (-1.24 – -0.01), < 0.05) and level of formal education (OR: -0.33 (-0.81 – -0.34), p< 0.001). All the variables are non-formal education predictors.

After the previous analysis, we wanted to examine the results when we place all the predictors into one common model. In a multivariate model, predictors that stand out as statistically important are: gender (OR: -0.27 (-1.33 – -0.48), p< 0.001) and the level of formal education (OR: -0.33 (-0.81 – -0.35), p< 0.001). These variables altogether explain about 18% of the dependent variable variance. Therefore, gender and the level of formal edu-

cation influence the acceptance of non-formal education.

4. DISCUSSIONS

The survey was conducted on 198 respondents (the parents of eight grade pupils of an elementary school) in a completely homogenous environment in terms of gender. The focus of the survey was on: the presence of certain forms of non-formal education of parents, the parents' expectations of non-formal education, the level of acceptance of parental non-formal education in relation to both sociodemographic variables and on the parents' predictions of non-formal education.

Research results were related to certain forms of parental non-formal education, firstly those realized in schools, secondly forms of non-formal education such as self-education through reading literary works, attending parent counseling sessions or talking to a specialist about child upbringing and attending schools for parents.

Research shows that from the above mentioned forms of parental non-formal education the most dominant form is parent-teacher meeting (93.4%). This form of non-formal education is traditionally very well accepted by parents. The value of this form is reflected in the converting/receiving of formal information (about success, truancy, eventual problems etc.). Frontal or interactive work type (most frequently educational workshops) is very common for parent-teacher meetings. Parents usually feel comfortable in those situations.

Unsatisfactory results from the survey are the readiness of parents to attend lectures for parents (34.4%) and individual counseling on the parents' initiative (33.8%) as forms of non-formal education realized in schools. Lectures for parents allow them to gather information on various topics about child growth and development which can help influence their children's quality of life as well as their own. Therefore, results show that it is necessary for schools to get more involved on in the field of improving the quality of lectures for parents. During individual counseling, parents can acquire various information on their own initiative which are in the focus of their interests. In order for a lecture to have a functional value it is necessary for parents to follow the latest trends when it comes to topics from the field of responsible parenting, as well as the methods of their realization. It is only natural that lectures in which the parents participate will have a high efficiency level.

Parents are interested in individual counseling on the head teacher's initiative to a minor degree (23.7%). Parents usually feel like passive receivers of information, and they usually (or mostly) see any the benefit. In these situations, parents feel uncomfortable because the most common causes for counseling are not only a bad overall grade and inappropriate behavior, but also the most common reason is the lack of communication between partners. Also, the parents are content, to a small degree, even with written communication with the head teacher (7.6%) because they are very sensitive (they often take things personal) about the assessment of their children's achievement and behavior.

An unexpected low score was observed in the form of non-formal education related to consulting the school's psychologist or pedagogue (17.7%). These results indicate that the parents are unaware of the significance of cooperation with the school counselors and the fact that they can provide assistance on the field of their child's education and upbringing.

Parents least correspond to the form of non-formal education in relation to work in the parent council (12.1%) and performing certain tasks in school (7.1%). The low score in this field can be attributed to the school's inadequately developed system of parent support. Establishing educational aims, planning and realization in cooperation with the school are relevant activities for parents because they have the opportunity to implement their educational needs which relate to responsible parenting into regular school activities.

Examination of the scores concerning the presence of certain forms of parental non-formal education that had been realized in cooperation with the school leads to the conclusion that the parents possess a positive attitude towards non-formal education which certainly influences their competences as parents. They are aware that neither school nor family alone is able to satisfy the child's educational needs.

Parents are constantly striving to become better at parenting. There are forms of non-formal education that can assist them in their endeavor: literature concerning parents' education on the topic of family life and child upbringing, counseling sessions for parents, consulting a specialist about child upbringing, attending a school for parents etc. Analysis of the research results shows that the final scores in terms of the above mentioned forms of non-formal education are quite low.

Concerning the question of non-formal education outside schools according to the parents' answers, the highest percentage can be observed in the field of constant education on family life and child upbringing (16.7%). The final result indicates that parents are still not entirely aware of the need to take the initiative and gather information related to child upbringing with the usage of literary works. This certainly represents a way to successful parenting.

The results show that counseling sessions for parents (9.1%) and schools for parents (10.1%) are forms of non-formal education with the lowest percentage. Modern society expects that parents possess competencies for responsible parenting, on the other hand it lacks investment for the development of an organized system of institutions and programs for parental education. The reason for this minimal parental involvement is the not-so-widespread system of previously mentioned forms of non-formal education.

We can conclude that from all the forms of non-formal education parents are most content with the parent-teacher meetings, and least with taking part in school tasks and also with organized forms such as counseling sessions for parents and schools for parents. The analysis of the final results indicates that the sub-hypothesis relating to the expectations that the dominant forms of non-formal parental education would be the forms organized by schools is confirmed.

Parents are mostly interested in cooperation with the school in forms which provide them with information about the overall grade or when a problem occurs which they want to settle in terms of individual contact. Schools and society in general should organize and involve parents into various forms of non-formal education.

When the parents' expectations of non-formal education are concerned, results show that parents mostly expect that through cooperated acting with the teachers/school counselors they will create the most stimulating conditions for child development and upbringing (78.8%). Forms of cooperation with schools are the most secure way of acquiring information and educating others. These forms refer to parent-teacher meetings, individual counseling, lectures for parents, and parent involvement in certain tasks in schools. This means that schools should work on creating an environment which will encourage child development.

A large percentage of parents answered that through non-formal education they wish to facilitate their child's involvement in school's life (59.1%). Therefore, parents are aware of the functional role of education packages which are structured in a way that enables parents to follow activities which would help them in solving various educational issues. This is possible only if a partnership between parents and the school is formed.

The result concerning the parents' expectations to unify their demands of the child with he views and demands of the school is pretty low (38.4%). In order to take this expectation to a higher level it is necessary to develop such modalities of parental non-formal education which would affirm the parents' flexibility on one hand, and the school's empathy towards the parents' problems on the other. The refrain displayed by parents is the result of their unwillingness for cooperation, overprotective attitude towards the child and the view that the school and parents are on the opposing sides.

Another low score displayed the parents' expectations to get acquainted with the adequate procedures which should be applied to the field of child upbringing (23.7%). Traditional education models are apparently present in today's families where the education model ''as I was brought up'' is dominant. However, it is important to work on the programs of parental non-formal education which are a result of following modern literary works in the fields of family and parenting, as well as to model the educational content and present it in a way that its high motivational potential is obvious.

Another low percentage of parents expect to assist the school in child upbringing through non-formal education (21.7%). The reason for this is that parents in a greater degree think of school as an educational institution. Parents' interests, which are in the line with the school success and not educational work, are most dominant.

Based on the previous analysis, we can partially confirm our sub-hypothesis relating to the parents' expectations of non-formal education, because above the parents' expectations to facilitate the child's involvement in school life, according to the survey, there is the fact that the parents mostly expect that by cooperating with the teachers/ school counselorsthey will create the most stimulating conditions for child development and upbringing.

As a focus of this research we set the level of acceptance of parental non-formal education in comparison to socio-demograph-

ic variables. The survey results indicate the importance of gender, work status and the level of formal education in the acceptance of non-formal education by parents. Fathers displayed a greater interest towards non-formal education despite the traditional belief that mothers are more involved in child education and upbringing. The result seems ambiguous. The result can be interpreted: firstly, as a definition of a father's role in the modern society, and secondly, as a general status of a family and society (the family still doesn't occupy the first place in society, the systems of family assistance are undeveloped, high unemployment rate, dysfunctional family patterns etc.).

Perception of the unemployed parents has a higher score on non-formal education. This result indicates that parents of the above mentioned status display a greater interest towards education and non-formal forms of involvement in various activities with the aim of creating a competent parent.

The level of acceptance of non-formal education is greater with parents of a lower level of formal education. The greatest level of acceptance was observed in parents with a high school degree as opposed to those with an associate degree or a university degree. Therefore, it is necessary to develop modalities of non-formal education which would involve parents of various educational levels. At a basic level, theoretical knowledge is of great importance, but knowledge migration as an important dimension cannot be ignored.

The analyses in comparison to sociodemographic variables are pointing to the fact that he sub-hypothesis relating to the expectation that mothers, unemployed parents and parents with the highest level of formal education to a greater extent accept non-formal education is confirmed.

All mentioned variables are a prediction of non-formal education. Therefore, the analysis in this segment indicates that the subhypothesis relating to the predictors of nonformal parental education would be gender, work status and the level of formal education is confirmed.

In a multivariate model gender and the level of formal education are considered to be statistically important predictors.

The resulting analysis stresses that is it necessary to create a participative and open environment both in schools and outside them with the aim of encouraging parental participation in various modalities of non-formal education.

5. CONCLUSIONS

The function of parental pedagogical education is to obtain answers from various dimensions of the parenting process. One of the main objectives of the above mentioned type of education is the transfer of knowledge which shapes the roles of parents in the sense that their components are upgraded to the level of maturation through experience in the field of competent parenting. Therefore, the parent attains great confidence in the process, he is encouraged for participation and attaining new parental experiences with a high level of responsibilities within the family as a system. Pedagogical education can be organized within all institutions with the focus on childhood assistance. In those conditions parents would have a participatory role. It should also be mentioned that acquisition of theoretical knowledge as well as comparative analysis and experience categorization of the same field of study are equally important for the development of a competent parent.

Modern society and its rapid, dynamic changes demand the development of new formal and non-formal modalities in this field of study which are not based on traditional work forms, but various work forms and interactive methods. It is necessary to offer new contexts which bear the function of complete parental involvement, contexts where they would receive basic assistance in the process of parenting. Non-formal parental education supports the concept of life-long education.

This survey leads to the conclusion that organizing efficient forms of parental nonformal education (first of all those realized in schools, secondly, other forms of non-formal education such as following scientific publications, attending counseling sessions for parents, or possible conversations with a specialist about child upbringing and attending schools for parents) is possible only when the modality possesses: a stable organizational and content structure, continuous planning, monitoring and quality control from multidisciplinary professional teams, as well as instruction materials (texts, audio and video cassettes/CDs, guides etc.) which serve not only the parents' educational needs but also their expectations. Therefore, models of non-formal education should be structured in the way that enables parents to follow the activities that could help them in resolving some issues within the family system. An additional characteristic of various forms of this type of education is in the fact that they provide opportunities for self-re-

alization of parental competencies for responsible parenting. Teachers engaged in various forms of parental non-formal education have to be competent individuals who would, above all, understand parents/students, organize activities with se-quences of experience transfers and provide the opportunity for parents to understand and apply their newly acquired knowledge through practical activities. The key feature of parental non-formal education is that: parents/students are involved out of their own free will, it possesses a very high motivational potential, and there are often no restriction elements when it comes to age, previous educational level and experiences (the only thing necessary is that there exist realistic possibilities for monitoring the program). This implies that such a parental role in non-formal education enables their expectations of non-formal education to get even higher. At the same time this is predictive of a high level of acceptance of parental non-formal education in comparison to socio-demographic variables (gender, work status and the level of formal education).

The analysis of the results obtained in this research suggest that the main hypothesis that forms of non-formal parental education (forms which were organized by schools and those organized outside the school context) are different in terms of functions within responsible parenting is confirmed.

Formal and non-formal parental education shouldn't have the status of opposing systems. It is important to understand non-formal parental education as a complement of formal education. Therefore, non-formal education presents a new opportunity for parents to master the contents that were not available to them, that were insufficient or yet insufficiently clear within the fields of formal education.

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Conflict of interests

Authors declare no conflict of interest.

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SOME METHODOLOGICAL ASPECTS OF THE EVALUATION OF STUDENTS' EDUCATIONAL ACHIEVEMENTS AT UNIVERSITY

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ABSTRACT

The article deals with some methodological aspects of evaluation of students' educational achievements at university. Evaluation being as an essential component of the educational process includes controlling, measurement and assessment. Studying the methodological aspects of evaluation, we refer to the activity and contextual approaches. Activity approach involves using of the active forms and methods of evaluation, such as web-quests, discussions, presentations of the projects, portfolio, etc. Contextual approach allows to organize the evaluation of students' educational achievements, providing the professional activities, which help them to master their skills. The author concludes that the use of contemporary forms of evaluation in the educational process of the university will contribute to the effectiveness of the educational process itself.

1. INTRODUCTION

Higher education is undergoing global changes in the modern world. Nowadays modern society demands a new type of a competent professional in the field of the professional activities. Today, modern higher education is not just a set of knowledge, but also a formation of a coherent picture of the world with its norms, ideals, values, which serve as a reference point of the human relations. It is a fact, that there are more requirements to the modern university graduates (Stošić, L., 2015; Stošić, L. and Stošić, I., 2013; Galustyan, O. V., 2014, 2015). It is necessary to educate the specialists of a new type, the main characteristics of whose is high-level professional qualification, ability to self-development, critical thinking, ability to solve professional problems of different levels. The competitiveness of contemporary specialists relates to the level of the development of their competences. Thus, the problem of students' evaluation of educational achievements at university is urgent nowadays.

The main theoretical aspects of students' evaluation of educational achievements were studied by (Balzer, L., 2006, 2015; Balzer, L. et al., 2002; Gowin, D. B. and Millman, J. 1981; Kromrey, H., 2003; Wottawa, H. and Thierau, H., 2001). The categories reflected in their works allowed to identify the general idea that the evaluation of students' educational achievements is the essential component of the educational process which includes controlling, measurement and assessment. Controlling includes checking and measurement, and, thus, eliminates the management of the educational process; measurement includes estimation and assessment; assessment represents only testing.

The analysis of the psychological and pedagogical literature devoted to the evaluation in the educational process has shown, that the scientists, who work on problems of higher education, confirm the need of the systematic study of the issues related to the organization of evaluation of students' educational achievements at contemporary high school. The authors (Balzer, L., 2006, 2015; Balzer, L. et al., 2002; Gowin, D. B. and Millman, J. 1981; Kromrey, H., 2003; Wottawa, H. and Thierau, H., 2001) note that the evaluation as the major component of the teaching and learning process of contemporary higher education requires the constant updating of diag-

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nostic tools and the development of the evaluation criteria of learning outcomes.

2. ACTIVITY AND CONTEXTUAL APPROACHES

The important methodological guideline of organizing evaluation of students' educational achievements is activity approach. The main ideas of activity approach are discussed in the works of Russian scientists (Asmolov, A. G. 2009; Davydov, V. V., 1972, 1981; Davydov, V. V. at all., 1982; El'konin, D. B. at all., 1989; Galperin, P. Y., 1999; Galperin, P. Y. and Talyzina, N. F., 1979; Lektorsky, V. A. 2008; Levina, M. M., 2009; Rubinstein, S. L., 1989; Schedrovitsky, G. P. and Kotelnikov, S. I., 1983; Slobodchikov, V. I., 1998). The leading idea of the activity approach is providing personal and professional development which is based on the active position of the student. The basic category of this approach is the category of activity. When Rubinstein S. L. (1989) was making the analysis of the basic psychological processes of human activity, he concludes, that activity is a human relation to the world, in case it is purposeful and conscious. Leontiev A. N. (1976) confirms the relation of the consciousness to activity as well. The scientist considers the equivalent of activity is the action itself. The research by Leontiev A. N. (1976) suggests that the activity is also a condition for the formation of human sense. That means, that the activities generate a sense of evaluation of students' educational achievements, thus, the development of reflection is going on. Lektorsky V. A. (2008) declared that there was special importance of reflection in students' activities. Lektorsky V. A. (2008) considered that the implementation of the activity approach is based on the formation of personal reflection, the reflection of the work and actions. So, we consider activity approach is an important methodological approach to the problem of evaluation of students' educational achievements.

Rubinstein S. L. (1989) and Leontiev A. N. (1976) noted in their scientific works that activity is the basis of the formation of students' personality. The authors state that the primary function of activity is communication, because it is included in the collective communication activities. We see the implementation of this idea in the use of evaluation tools in a virtual educational environment. Schedrovitsky G. P. and Kotelnikov S. I. (1983) consider the implementation of activity approach in using such forms of evaluation as educational and business games. Educational and business games serve as an important form of evaluation of students' educational achievements.

Asmolov A. G. (2009) identifies motivational and technological components of activity. The motivational component of evaluation includes motive and its result. The technological component includes technologies of achieving the aim. Galperin P. Y. (1999) suggests that activity is the gradual formation of mental actions. Thus, the formation of professional competency should be proceeded step by step during the evaluation of students' educational achievements.

The main ideas of activity approach to the organization evaluation of students' educational achievements we see in the following statements:

1. Evaluation of students' educational achievements is realized in dynamic activity. So, it is necessary to choose active forms of evaluation.
2. Professional and personal development of the future specialists is carried out in activity.
3. Reflection is a component of evaluation.
4. All types and forms of evaluation of students' educational achievements should be endowed with the personal sense. The personal sense and the attitude of the students to the results of their own activity lead to their personal development.
5. Student is a subject of activity. And, consequently, student is a subject of evaluation. Thus, students should take an active part in the choice of forms and methods of evaluation of their activities.
6. Communication as a part of activity and as part of the evaluation of students' educational achievements is realized both in contact and in virtual educational environments.
7. Subject relations (teacher ↔ student, teacher ↔ students, student ↔ student, student ↔ students) should be implemented at all levels of evaluation.

Schedrovitsky G. P. and Kotelnikov S.I. (1983) considered that the important aspect of the activity approach was "collective thinking activity". The essence of "collective thinking activity" is the development of the personality which takes place in the joint activity. This position is very important for our study because evaluation of students' educational achievements is seen from the position of such joint activities as teacher ↔ student, teacher ↔

students, student ↔ student, student ↔ students. We see the realization of this position in implementation of the teachers' evaluation of the students' achievements and mutual evaluation of the students. In studies (Leontiev A. N. (1976)) the structure of activity includes motivation, purpose, and condition. El'konin D. B. and Davydov V. V. (1989) saw the implementation of the activity approach in communication and in the formation of personal sense. In their opinion, personal self-improvement and the development of personal potentiality is realized due to the active position of the students.

The next approach which is very important for our research of evaluation of students' educational achievements is contextual approach. This approach is developed by (Verbitsky, A. A., 1990, 1991, 1995, 2004; Agapova, O. I. at all., 1987; Verbitsky, A. A. and Larionova, O. G., 2006; Verbitsky, A. A. and Dubovitskaya, T. D., 2003; Verbitsky, A. A. and Zhukova, N. V., 2006; Verbitsky, A. A. and Kalashnikov, V. G., 2012). When using contextual approach, we should be primarily focused on the professional activities of a future specialist. The purpose of evaluation of students' educational achievements based on the contextual approach is not to obtain the system of information, but the formation of the ability to fulfill future professional activities. Information takes place in the structure of evaluation activities of the student till the certain point. Then this information should be developed into the practical implementation. This means, that educational activity of the students should obtain features of their future professions. According to the contextual approach, the content the evaluation tools should be closely connected with the future professional activity, that gives integrity, system organization and personal meaning to evaluation. Content of evaluation materials is transformed into the object of professional activity. It is important to mention that the contents and conditions of professional activity have always been probabilistic and problematic. Therefore, the basic unit of evaluation of students' educational achievements based on the contextual approach is not a task, which is performed due to the example, but problem situation, which assumes the inclusion of productive thinking of the student. The solution of professional-oriented tasks allows the integration of the competences of future specialists. It also allows natural entry into the profession by means of evaluation of students' educational achievements.

The major task of evaluation based on of the contextual approach is to ensure the transition from training activity to the professional one by means of professional-oriented situations. We consider case study as a successful method of evaluation. The fact is that while organizing the evaluation of students' educational achievements, they fulfill all the requirements of the teachers without showing their own initiative, while the professional activity demands the ability to take the lead, set and achieve goals, which are integral features of the creative development of the personality.

Principles of contextual approach formulated by Verbitsky A. A. (2004) can be successfully implemented in the organization of evaluation of students' educational achievements:

1) The principle of personal inclusion of the students in the evaluation activities. This means organizing of students' self-control.

2) The principle of consistent use of evaluation methods we see in use both traditional methods and innovations (e.g. coaching, flipped learning, BYOD (bring your own device)).

3) The principle of problem-based methods of evaluation involves the use of case study.

4) The principle of the adequacy of forms of evaluation due to its purpose which requires the use of such forms as web-quest and portfolio.

5) The principle of the leading role of the joint activity, interpersonal interaction and dialogic communication that means organization of the mutual control of the students.

6) The principle of combination of traditional and innovative technologies in the organization of evaluation of students' educational achievements.

7) The principle of transparency requires the organization of evaluation of students' educational achievements using the virtual educational environment.

The fact is, that the evaluation of students' educational achievements takes place in an artificial environment, which can not recreate the atmosphere of the professional activities. Besides, the evaluation of educational achievements of students involves the assessment of the personal results, but not the collective ones. The working process usually focuses on joint professional activity. The realization of evaluation of students' educational achievements based on the contextual approach we see in using problem-oriented methods such as case study. It allows to recre-

ate future professional activity using problem-oriented tasks. It is connected to the changes of the social position of the students. That means, that the transition from training activities to the professional activity is a complex process. The implementation of skills is a challenge for many graduates. The system of problem situations allows the formation of theoretical and practical professional thinking of the future specialists.

Evaluation of students' educational achievements based on contextual approach determines the characteristics of its organization. The use of such forms of evaluation as web-quests, seminars, discussions, educational and business games allows to reproduce the future professional work situation.

Evaluation of students' educational achievements suggests using the following forms of evaluation the activity of students:

• Evaluation activities of academic type, which is dominated by the assimilation of information, considering already formed competence as of the students;

• Evaluation activities of a quasi-professional type simulates the conditions of future professional activity, the employment relationships. That means, that the solution of the problems and finding the ways out of the professional situations.

• Evaluation activities of educational and professional type requires performing of the scientific research and practical developments of students (scientific and research work, students' projects, grant applications, participation at the scientific conferences, publication of scientific results at journals, etc.).

However, it should be noted that, contextual education by Verbitsky A. A. (2004), has three models such as semiotic, simulation and social one. The semiotic model is revealed in verbal or written texts, which contain information of a discipline (eg. lecture materials, traditional tasks, instructions for preparation for practical classes, training programs, etc.). Unit of the student work is a substantive action. Evaluation due to the simulation model is a modification of the future professional activity, which requires analysis and decision-making based on the theoretical information. Unit of the student work is subject activity, the primary aim of which is the transformation of the practical simulated professional situations. Evaluation based on the social model is a piece of professional activity, which is analyzed and converted into a form of joint activity of the students in the group. Evaluation based on the social model we see in conducting the evaluation of educational achievements of the students using the virtual educational environment, where the activity in the interactive groups as the social models of the professional environment leads to the formation of the social competence of the future specialists.

3. CONCLUSION

Social and economic processes taking place in the educational environment and the world economy are reflected in the training of qualified specialists for various spheres. Since the labor market requires high demands to the future specialist, there is a need for the formation of specialists of a new type, the main characteristics of whose are high level professional qualification, ability to self-development, critical thinking, solving professional problems of various levels. All the mentioned above facts produce ensuring of the development of education. These factors are prerequisite for the development of some methodological aspects of the evaluation of students' educational achievements at university. Summarizing the results of the theoretical research we conclude, that the evaluation of students' educational achievements at university is characterized by contradictions and problems which require serious consideration. Competitiveness of the future specialists is based on the level of their competencies. Organization of the evaluation of students' educational achievements at university is revealed in various forms and using various methods of evaluation in the contact and virtual educational environment, which should complement each other harmoniously.

Summing up, it should be noted, that the use of the activity and contextual approach to the evaluation of students' educational achievements at university will allow conducting evaluation, the main aim of which is comprehensive development of the students' personality, their creative thinking, personal and professional growth.

Conflict of interests

Author declares no conflict of interest.

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EDUCATIONAL NEEDS OF TEACHER FOR INTRODUCTION AND APPLICATION OF INNOVATIVE MODELS IN EDUCATIONAL WORK TO IMPROVE TEACHING

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ABSTRACT

The needs and interests of teachers for the imple-mentation of innovative models in teaching are the key factor that determines raising quality of teaching at the school. In this context, it should be borne in mind that the educational needs of teachers are closely linked to the necessity of lifelong learning, because nowadays the teachers work skills are not enough that they adopted during schooling twenty years ago or more. The paper analyzes the educa-tional needs of teachers in exploring and imple-menting innovative work models of teaching. The greatest interest of teachers is for introduc-tion and implementing individualized teaching.

1. INTRODUCTION

Although the pedagogical, andragogical and psychological literature devoted many research papers and discussion of educational needs of people in different ages, professions and position in the work process, still cannot be concluded that the achieved responses were fully satisfying. It is a generally accepted standpoint that the needs are in the range from biological to cultural and educational.

In the broadest sense, human needs are defined as dynamic forces that drive human activities and influence his behavior. It is also a generally accepted standpoint that the human needs should and must be studied from various aspects. At multidisciplinary explanation of needs also Maslov (Maslow, 1982) pointed out with his theory of self-actualization and explanations that the needs are hierarchically related because lower level needs must be satisfied before it activates needs of higher levels. It is also known, that man as a social being, must satisfy the educational needs that are only one relevant part of its total needs throughout his life and work. Hence the talk of lifelong learning as a process that educational needs are satisfied throughout the work and life of man.

Furthermore, it is important to know that the needs are directly related to the desires and endeavors of the individual, not only to supplement the lack of something (homeostasis), but also to contribute to his own development, which brings him satisfaction (self-actualization). This is particularly important for an explanation and identification of training needs of employees in education, including the teachers who work in the immediate teaching practice. In this regard, it should be noted that despite numerous explanations, the nature of human needs in general, and especially the educational needs of employees, there is a dilemma as to whether educational needs or the need for general or specific education, is part of every educational activity, i.e. whether they have the character of employee motivation or they lack motivational force.

It is also a generally accepted under-

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standing by the majority of authors who deal with the problems of educational needs, and regardless of the different views on the structure of educational needs as well as differences in their definition, that they are the basis of every educational activity and that they are an inevitable aspect of any research in education.

Educational needs are the difference between what is and what is necessary or desirable to be between the current, possessed, and reached, desired, anticipated, or demanding standardized state on the other hand (Despotović, 2000). Educational needs are directly related to the individual's wishes and can be a strong driving force in innovation and modernization of educational work in general, and particularly in the modernization of the direct teaching of each teacher.

The needs are the internal initiator of human activity. It is hard to consider something as a need when an individual doesn't experience it as such. If teachers have developed positive attitudes towards innovation, if they perceive innovation as the need for modernization of educational work, then innovations will increasingly enter into the practice of our schools. If teachers aren't motivated enough, innovation, regardless of its internal capabilities, there is no chance for success (Vilotijević, M., Vilotijević, N., 2008).

1.1. Introducitng innovations in the teaching

Many educators are engaged in innovation: Mc Clelland D. (1961), Rogers, E., (1962), Schön, D. (1967), Vlahović, B. (1996), Okoń, W. (1978), Prucha, J. (1983), Vlahović, B. (1996), Đorđević, J. (1996), Vilotijević, M., Mandić, M., 2015.

Under the influence of a very rapid progress of science and technology innovations are coming into teaching. But, school as a very conservative institution, takes a long time for scientific and technological break-throughs to be introduced into teaching. Innovations should enable, better use of the teacher's work and technical resources, increasing economic efficiency and increasing performance in teaching and in educational work, increasing productivity. Innovation is the requirement that the school is not lagging behind the social and technological changes in the reality that every day intensive change (Vilotijević, M., Mandić, M., 2015).

Substantial cause for the slow penetration of innovation in the teaching process is the conservatism of a large number of teachers who feel safer when they apply traditional methods, proven methods and resources, rather than innovation, whose results they suspect (Vilotijević, M., Mandić, M., 2015). Conservatism and traditionalism of teacher's area major obstacle to the entry of information technology in teaching and learning. Reactions of teachers to introduction of new technologies and innovation in school ranges between two extremes - from complete enthusiasm to the decisive rejection. Most of them are moderate in their attitudes towards multimedia. They consider multimedia welcome and want to incorporate it into their lessons, but they are still reserved to the technology itself, its purpose in teaching and learning and support to teachers and students who use it. This means that they should have quite a specific theoretical knowledge and practical skills for programming, introduction to teaching practice, monitoring and evaluation of innovative models of work. This ability implies not only knowledge of the content, i.e. expert knowledge in the field where innovation is done by applying innovative models of work, but also quite certain methodical knowledge (Banđur, 2001).

Potkonjak says that the basic, most important and key factor and carrier innovation in the educational and teaching organized in school is the teacher. Without an innovative teacher, there can be no innovative school"(Potkonjak, 2013).

Classes in quality - innovative school itself should be such, quality and innovative. "To make the learning process, good, interesting, rich, innovative, indispensable well-prepared teachers are highly competent and didactic - methodical culture, the teachers themselves are constantly improving. Teaching has the necessary qualities if respected cognitive and other differences among students and enables everyone to solve tasks in their own way "(Vilotijević, M. 2000).

Stošić says that teachers, students and the school itself have now found themselves in a very different information environment than before. Schools that accept this environment will be much more modern and more successful and will not look like traditional schools where the teacher and the textbook are the only available sources of knowledge. By applying information technology, schools can continually innovate their new knowledge. Innovation is the requirement so that the school does not remain at the traditional level (Stošić, Stošić, 2013).

Educational innovations are the connective "tissue" of the information society without it's changes it cannot be. Promotion and realization of innovation in the information society in all aspects represents a large number of industry specific factors. But the main factor of these activities is man and his ability and willingness to innovate enriches the educational process. To make educational innovations enter the realization and development of the information society requires a collective competence for innovative activities. (Брындин, Е. Г. 2011)

A teacher's decision to accept or reject the innovation is conditioned by many factors. Mr. Vilotijević says that the teacher is faced with more choices: a) he may adopt it if it is in accordance with his understanding of the essence of the teaching process; b) he can accept it as a potential asset, but to elaborate and upgrade it in accordance with his vision of teaching, and only than to apply it; c) he can wait with application until he realizes if this innovation is accepted by other teachers; d) he can completely reject it; e) he can partially correct his vision of the teaching problem in accordance with the knowledge and understanding of the innovation and then to apply it practically; f) he can completely dismiss his knowledge and understanding of a certain educational problem and to accept the innovation (Vilotijević, G., 2011).

1.2. Theoretical orientations about teaching and studying

For the teaching process and education in general what is very important are theoretical orientations, which should contribute to the increase of the quality in teaching activity to a higher level. Among the most recenttheories of studying are interactive, constructive and humanistic.

Interactive theories are based on Hegel's postulate of the "I" identity, which states that identity and self-confidence cannot be formed without an interaction between the "I" and others. This idea is present in the critical theory of the Frankfurt philosophic group, which insists on a democratic discourse as a way of reaching truths and cognition. On these ideas, critical-communicative didactics were developed, in which the student-student and student-teacher interaction is one of the key categories. That is in collision with the educational process, in which the student is the object. What is required is that the teacher-student interaction, although asymmetric, should be a relation of mutual respect even though students are less experienced than teachers. Petersen points out that didactics, especially communicative one, in its basis have to have three important factors: interactive relation to the educational process, the school obligation to act socially, and finally, the attitude towards the existence of the acting subject. Bruner and Vigotski point out in their conceptions of studies that interaction has great importance for personal development of a student. Interaction is the base of cooperative teaching, which was the topic of many of our authors, among whom are I. Ivić, D. Branković, N. Suzić, and others. The basic assumption for the interactive teaching is modeling of working and living situations, scenic reviews, mutual problem-solving. There is no domination of any of the participants in the educational process. Each student is a subject, each one of them actively participates in the studying process, and each one has his or her studying path. The teaching process is democratic, students and teachers work together. Every individual brings his own individuality into the teaching process. They also bring their knowledge, experience, ideas, and a way of activity. Forms of work are individual, in pairs or in groups. What is created is the environment of educational interaction, which is characteristic for its openness, mutual interaction of the participants, breach of arguments, mutual marking and control. Feedback is obligatory.

Famous psychologist Wartofsky (1990) says that a child is not some special person who is developed from some fixed configura-tion of characteristics, dispositions and previously created possibilities. On the other hand, the world is not some eternal and objective network of conditional factors, which are acquired at birth, so that from a passive succumbing ball we could shape it into an externally predetermined structure. The child is a participant in its personal formation, as well as the formation of the world, but that participant whose participation develops in the context of the inevitable social and historical practice.

This Wartofsky's attitude is in a complete accordance with the theories of Z. Piaget and L. Vigotsky, in which they point out that the influence of the environment onto the individual and vice versa. Bytheir nature, these theories are interactive because they point out the interaction between an individual and the environment as a development priority, but between them there are certain differences in relation to the role of particular environmental

elements in the process of development. Both these theoreticians perceive the development as a series of qualitatively different phases, not as piling of developmental cubes. A child grows and matures through universal developmental phases, characteristic of certain age, but going through the physiological development is not enough. It is necessary for a child to be active in its environment. In constructive conception, especially with Piaget, it is necessary for an individual to possess cognitive imbalance, that is, confrontation between what they already know and new knowledge. As long as an individual can assimilate the surrounding world, the development goes through the same phase. If the existing cognitive structure of an individual is too narrow and cannot accept new information, then it is accommodated or changed and thus moves onto a higher level. This is, by Piaget, the confrontation between the view of an individual in the world and the environmental objects which cannot be embedded into their cognitive schemes, so they are forced to create new ones, and by doing so, assimilation and accommodation are permeated.

From Piaget's theory, a very important pedagogical message can be deduced: student's cognition has to be the result of their activity through which they create their cognitive structures.

The student's activity should not be understood only as their relationship with the physical environment, but also as a thinking activity, since activity goes from the external into the internal, mental plan.

Although Piaget pointed out the importance of social relations for the development of an individual, this is more stressed with Vigotsky, who underlines an important formative function of social interactions, without which there is no development. It is a mechanism in which the biological in an individual becomes cultural. Teacher and student are in an asymmetric interaction since the former has more knowledge and experience than the latter. Vigotsky considers this asymmetry as a developmental factor since it enables the formation of functions which become the student's property. Developmental improvement starts from the zone of real development which a student has already acquired and is moving into the zone of the next level of development which a student has yet to acquire. The pedagogical value of this assumption is extremely important. In the zone of the next level a student cannot acquire certain functions by himself, but he will be able to if helped by a teacher. The zone of the next developmental level is characteristic of the fact that a new structure is started on it, which, with help of a certain teacher, can be completely formed. In that zone, the influence of the teacher has the largest developmental effects, that is, it contributes to the acquisitions of new cognitive structures.

A new dimension in education and studying has been started by the humanistic theory. Its founder, Abraham Maslov (1982), in his work Motivation and Personality incline in his approach to man and studying to internal determination in contrast to the behaviorist Skinner, who pointed out external determination as crucial to both behavior and studying. Considering education more widely than it was traditionally accepted, Maslov points out that it is primarily necessary to nourish humanity in each individual. He does not consider learning primarily as pure acquisition of associations, habits and skills which by its character refer externally to a man. Truly, it is a useful part of a person's studying in the technological society, which helps him study objects and things more easily. A man can practice his habits by using a behavioristic approach, can study a foreign language by using a method of associations, but in that way, he cannot be taught humanity. Apart from that, the world can give someone only what he or she is up to, what he or she is suitable for, and finally, a person can get from the world or give to it only what he or she represents. Maslov reckons that today we can clearly see two explicit approaches to studying. In the first approach, education is considered as transferring of knowledge necessary for the industrial society. Students do not ask themselves why they study and what for. The basic concern of school is efficiency, that is, to make students acquire as many facts as possible with minimal spending of time, money and energy. The function and the main goal of education is, in its nature, human. A pedagogist, in that case, is interested in self-actualization, that is, to help the student grow into a good man as much as possible.

The two mentioned approaches are external and internal. The humanistic approach is characterized by internal education which enables the student to acquire such knowledge and skills which will make him a good person. In that case, the problem of education will not come down to a requirement for acquisition of information with a less or bigger waste of time and money, but how the student will best understand and evaluate that piece of informa-

tion, so that he could include it into his experience for further usage in various areas of life and work. In that case, knowledge becomes useful, as well as the learning process itself.

2. MATERIALS AND METHODS

About innovative teaching models written by many authors, among them Mandić, P. (1977), Махмутов, М. И., Мирза, И. М. (1977), Vilotijević, M., Vilotijevic, N. (2008), Лазарев В. С. (2008), Suzić, N. (2007) and other.

The subject of our empirical research is to examine the attitudes and opinions of teachers about the impact of innovative working models in teaching in the function of improving the quality of educational work in school.

Accordingly, we set a goal of this research - to determine the educational needs of teachers for exploring and implementing innovative models in teaching and that the views and needs, as well as the dependent variable, bring into a functional relationship with gender, level of education and work experience, as independent variables of research.

It was placed as the starting general hypothesis that teachers express a strong need for exploring and implementing innovative models of teaching in total, and there are no statistically significant differences in the needs of the respondents for exploring and implementing innovative models in teaching based on their gender, level of education and work experience.

In this study was used the descriptive scientific and research method in its pronounced analytical variant (Survey research method). By using this method, data will be collected about the attitudes of teachers towards the implementation of innovative models, which will allow the detection of relevant causal connections and performing the appropriate conclusions about the impact of innovation on the quality of the teaching process.

In statistical analysis of the obtained data were used in the following statistical procedures:

1. $\chi 2$-test we will apply to the processing of data provided in the form of frequencies (i.e. qualitative data). Cumulative trait of the $\chi 2$-test allows combining a greater number of other values in the same test. The significance of the hypothesis that contain more data sets we will calculate to the established pattern.

2. For testing the significance of differences in independent samples of our research, we will apply rank sum test (Wilcohonom-Test or Mann-Whitney U-test). Value of rank sum test we will calculate with the established pattern.

Given tasks and associated with hypothesis, will be tested on a representative sample which will consist of 300 teachers of six elementary schools in Vranje. The sample will be stratified - just a random character which will enable him to look like on the basic set from which it was taken. We combined a group of intentional (stratified) samples with unintentional (just-random) samples, by which we ensure that respondents are grouped into subgroups (stratums) and selection of respondents in sample may be made within the stratum, using a sample just-random nature.

3. RESULTS AND DISCUSSIONS

In order to investigate the educational needs of teachers for exploring and implementing innovative models of teaching a Likert scale is constructed, with the list of twenty statements. It evaluated the innovative models of teaching according to the degree of interest of teachers. Teachers were instructed to respond as much as they are interested for training in the field of innovative models in teaching, on the scale: “I’m very interested“, “I’m interested”, “I’m mostly interested“, “I’m not interested”, “I’m really not interested”. In the so constructed scale of attitudes of teachers’ answers “I am very interested “were estimated by five points, and the answer “I am very uninterested“ with one point.

In this way, by adding the answers for all teachers at all innovative working models of teaching it would be possible to determine the cumulative value (cumulative index) for each innovative model and scale as a whole. And so are determined individual gross scores (individual score) for each teacher, and the whole scale.

Then they calculated the scale value, or the arithmetic mean (M) as the average value assessment of interest in exploring and implementing innovative working models of teaching at all innovative models, as can be seen from the results that are presented in the tables. Analysis of so presented results of descriptive statistics for understanding the educational needs of teachers for exploring and implementing innovative models of teaching shows the largest teachers’ interest in learning about the application: individualized teaching (M = 4.39), programmed teaching (M = 4.17),

problem teaching (M = 4.05) and computer-informative teaching (M = 4.01).

Table 1. Descriptive statistics for understanding the educational needs of teachers for exploring and implementing innovative models in teaching

Innovative models	Mean	Std. Dev.	Skewness	Kurtosis
1. Individualized teaching	4.39	.77	-1.20	1.08
2. Programmed teaching	4.17	.94	-1.40	2.88
3. Problem teaching	4.05	.91	-1.09	1.37
4. Computer-informative teaching	4.01	1.04	-1.13	1.44
5. Team teaching	3.96	1.11	-1.38	2.25
6. Developing teaching	3.86	.94	-.24	-1.00
7. Interactive teaching	3.78	1.18	-1.34	2.20
8. Meaningfully-verbal teaching	3.71	1.04	-.55	-.23
9. Integrative teaching	3.70	.97	-.65	1.11
10. Heuristic teaching	3.63	1.04	-.22	-1.10
11. Project teaching	3.63	1.06	-.54	.22
12. Productive teaching	3.61	1.28	-.79	.02
13.Playacting teaching	3.60	1.12	-.64	-.015
14. Personally directed teaching	3.59	1.20	-.91	.62
15. Exemplary teaching	3.57	1.13	-.48	-.18
16. Micro teaching	3.52	1.14	-.53	-.02
17. Modular teaching	3.51	1.09	-.50	.13
18. Experiential teaching	3.50	1.13	-.60	.49
19. Outpacing teaching	3.47	1.14	-.36	-.55
20. Distance teaching	3.37	1.10	-.31	-.17
Cumulative index	**3.67**	**.86**	**-.30**	**-.01**

The least interest was manifested to learn and use: personally-directed teaching (M = 3.59), exemplary teaching (M = 3.57), micro teaching (M = 3.52), modular teaching (M = 3.51), experiential teaching (M = 3.50), outpacing teaching (M = 3.47) and learning in distance-distance teaching (M = 3.37).

The results show that the educational needs of teachers, i.e. teachers' interesting in exploring and implementing innovative models of teaching, are not distributed according to the normal distribution, but it is significantly different because it is evident that a much higher percentage of teachers are with-more positive than with the volatile and negative attitudes, according to the obtained Skewness and Kurtosis for each innovative model and for the scale as a whole.

That the teachers are most interested in exploring and implementing individualized teaching, programmed teaching, problem teaching and computer-informative teaching, shows not only the biggest scale values than the percentage of teachers who are interested in their introduction and implementation. Thus, 53.06% of the teachers pleaded like "very interested" for individualized teaching, 43,87% for programmed teaching, 33.67% for a problem-solving, and 38.77% for computer-informative teaching. On the other hand, only 24.48% of the teachers pleaded like "very interested" for introduction and application: personally - directed teaching, exemplary teaching 24,48%, 22,44% of micro teaching, 20,40% modular classes, 21.42% experiential teaching, 21,42% outpacing teaching and 17,34 % learning on distance - distance teaching. Obtained results showed that the teachers expressed a great need for exploring and implementing innovative working models in teaching, although there are obvious and significant differences in the intensity of interest in the introduction and implementation of innovative working models in teaching. In fact, there were found significant differences in some innovative models of teaching.

In this way, it confirms the initial hypothesis that respondents express a strong need for the introduction and implementation of innovative models of teaching in total.

4. CONCLUSIONS

Needs for innovative interventions in education are distinctive because there is a big discrepancy between the scientific and technical achievements and needs of labor, on one hand, and the quality of the educational process, on the other.

Weaknesses of traditional teaching - the dominance of teaching approaches, one-sidedness in the application forms, methods, teaching system, media poverty - bring very negative consequences. The teacher is active and the pupils are passive learners; to unequal pupils are placed the same requirements; requires a multitude of facts in which loses rules and laws; encourages the memorizing and disadvantage opinion; required reproduction, and absent application and creativity. The teaching process is uniform and boring, causing apathy among students. Modern achievements of pedagogical science and didactical theory, technical and technological advances, particularly the development of communication- information and media technologies al-

low traditional organizations of teaching and learning to gradually abandon and to apply organizational solutions, forms, teaching systems, methods and media that will make the learning process more intensive and more efficient. In teaching we must bring innovation.

Innovations have accelerated progress in each activity, as well as teaching at the school. Innovations contribute to greater efficiency of the educational process. The school must be constantly underchanges. Innovation is the requirement that the school does not lag behind other social and technological changes. School, as it was pointed out by Tolstoy must be the laboratory where the continuous experiment, discover and change.

The quality of the teaching process is measured by how much a teacher, while working with students, insistson the practical applicability of the acquired knowledge. This means that he strives to enable students to apply selfsame knowledge in a variety of situations (knowledge transfer). The quality of the applied practical knowledge is far higher than the bookish perfectly mastered content which remained only in the memory of students, and in life was not used. The man is intellectualy, diligently and valuable evolving and forming in practical activities. If working process is valued, it will have a major motivational incentive to teachers who will try to expertly and didactic-methodically perfecting.

Without development and innovative changes there is no raising quality of pedagogical work in school. In order for certain innovations to become an integral part of the teaching process, they must be accepted by the teacher. It is necessary first that teachers know about them and that they have formed positive attitudes. Attitudes, like valuable relation towards innovation, lead to their application in educational reality.

It is known that man as a social being, must satisfy and the educational needs that are relevant to only one part of his total needs throughout his lives and work. Hence the talk of lifelong learning as a process that educational needs are satisfied throughout the work and life of the man.

The results of this study observed as a whole, show that the surveyed teachers do not have the same level of information about the didactical characteristics and values of some innovative models in teaching, because it is evident that there are significant differences in the level of awareness of teachers in this regard. The results showed that teachers are informed with different intensity about some of the innovative models, but that differences were determined only with some innovative models in teaching.

Analysis of the results of descriptive statistics for understanding the educational needs of teachers for introduction and implementation of innovative models in teaching shows that the largest teachers' interest in learning about the application: individualized teaching (M = 4.39), programmed teaching (M = 4.17), problem teaching (M = 4.05) and computer-informative teaching (M = 4.01).

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Conflict of interests

Authors declare no conflict of interest.

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THE PREREQUISITES OF PROSOCIAL BEHAVIOR IN HUMAN ONTOGENY

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ABSTRACT

Understanding the development of moral attitudes toward unrelated individuals from different social groups may provide insights into the role of biological and cultural factors in prosocial behavior. Children (3–11 years old, N=80) were presented with moral dilemmas describing a conflict of interests between a con-specific (human) and another species (animals or aliens). Participants were asked to evaluate the behavior of a human in terms of 'good' and 'bad', and to choose whom they would help: a human aggressor who benefits at the expense of a victim in vital need, or the victim. Results showed that the older children preferred to help non-human victims significantly more often than the younger children. The evaluation of human actions was related to the proportion of such preferences. These findings are discussed from the perspectives of kin selection theory, group selection theory and the system-evolutionary approach. The implications of the study for moral education are suggested.

1. INTRODUCTION

Prosocial behavior benefits recipients, but often costs the giver (Simpson and Willer, 2008). The emergence of prosocial behavior is described with indirect fitness benefit from the biological perspective (Hamilton, 1964), whereas the social perspective is based on continuity of consecutive stages of development (Piaget, 1997) and corresponding acquisition of social norms and rules (Kolberg, 1974; Rest et al., 2000). Firstly, both perspectives lack consistent view of altruism toward other species. The help to other species by humans without obvious return may be an indicator of rule-guided moral behavior. Secondly, and more importantly, the biological and social considerations of the development of prosocial behavior still lack unequivocal integrity.

The acquisition of moral rules can be considered within cognitive development (Kolberg, 1974, Piaget, 1997, Rest et al., 2000), whereas the prerequisites for such learning may hinge on phylogenetic adaptations, including those formed via kin or group selection (Hamilton, 1964; Wilson, 1975). Accordingly, kin-selection has been considered as an important foundation for the emergence and strengthening the 'higher levels' of cooperation in evolution (e.g. West et al., 2007a). Therefore, prosocial behavior toward related or unrelated group members may have arisen at certain consecutive stages of phylogeny.

This succession can be revealed with moral decisions concerning close or distant others (Passini, 2016). Thus, we hypothesized that an individual would support more closely

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related group members at the early stages of ontogeny (as a more basic strategy of behavior), whereas more distinguished moral rules would emerge at the later stages. In the latter case, the rules of fairness would be applied not only to relatives (in-group members), but also to members of a less related group (out-group members).

Our hypothesis has initially been built on the basic theoretical framework of the system-evolutionary theory (Shvyrkov, 1986). From this perspective, a new behavior is subserved by co-activation of systems that had emerged during episodes of learning at successive stages of ontogenesis (Quintana, 1998; Arutyunova et al., 2013). A system elaborated during learning is a set of brain and body elements activity of which provides resultative interaction with the environment (Anokhin, 1974). A new form of behavior is based on simultaneous activation of newly formed system together with successively acquired systems that constitute prior experience. Therefore, the stage-wise description of the social attitudes development may contribute to elaboration of moral education principles.

In this study we compared moral decisions of children from 3 to 11 years old. The children evaluated actions in moral dilemmas presenting a choice between helping a human who captures a desirable resource for extra benefit (labeled as an 'aggressor'), and helping someone (humans, animals, or aliens) who has already been using this resource and needs it for survival (labeled as a 'victim').

The goal of this study is to investigate the emergence of new rule-guided forms of behavior and their prerequisite adaptations. We hypothesize that the attitudes develop from helping humans (as the basic and more ancient strategy of behavior) to helping non-humans through learning rules of fairness and justice within a culture and generalizing them to other creatures. Since these attitudes reflect corresponding moral rules, we also propose that the actions of human aggressors would be evaluated less positively by older children than by the younger children.

To our knowledge the behavior of humans who are forced to choose between an instinctive support of an in-group member and the preference based on moral rules has not been studied before. If the society invests in the deployment of the support, it is important to know what becomes of it during ontogeny. This study may also contribute to greater integration between empirical and theoretical work on altruism and prosocial behavior from the evolutionary perspective, of which there are only few examples (Leimar and Hammerstein, 2006).

2. MATERIALS AND METHODS

2.1. Participants

The participants were 80 Russian pre- and elementary schoolchildren (36 female), from 3 to 11 years old. We formed the following groups: 3–4 years old (N=15), 5–6 years old (N=24), 7–9 (N=24), 10–11 (N=17) (see Table 1).

Table 1. Descriptive statistics for the age groups.

Group	N	Age mean	S.D.	N female	N male
3–4 years old	15	4.33	.44	7	8
5–6 years old	24	5.65	.55	12	12
7–9 years old	24	8.23	.81	9	15
10–11 years old	17	10.49	.29	10	7

Parents were given full information and signed informed consent regarding the research and participation of their children. All procedures performed in studies involving human participants were was approved by the Ethics Committee of Federal State-Financed Institution, Institute of psychology of Russian Academy of Science.

2.2. Task

Children were asked to assess moral dilemmas representing situations where a human child (in-group member) benefited from harmful actions toward other characters (out-group members). The question was 'Who would you help?'. Helping a human child would deprive an out-group member of vital resources, whereas helping an out-group individual would deprive the human child of a benefit. The out-group characters were domestic animals (dogs), wild animals (squirrels), or aliens. An additional dilemma represented a choice between two humans. Each participant was presented with four dilemmas contrasting a victim and an aggressor. Each dilemma was illustrated with three color pictures (90*85 mm) showing the two conflicting characters and the resource. The pictures were shown along with oral presentation of the dilemmas. One of the dilemmas is given below:

There is a glade in the forest. Squirrels live in this glade. They eat and play there.

Squirrels are very afraid of humans, so they cannot live with them. Vanya wants to build a large house in this glade for his family because he has a very large family. Currently, they live in a very small house, which is uncomfortable. If Vanya builds a large house, squirrels would not live and play in this glade, as they would have nothing to eat; however, Vanya will have a large house for his family. Who would you like to help, the squirrels, so they can stay in this glade, or Vanya, so that he can build a large house for his family?

Additionally, we presented a control dilemma with a conflict between an animal and a human where the human could be deprived of a vital resource. In the latter dilemma, all participants chose to help the human.

Two sets of dilemmas were formed to control for the order of the presentation of characters (in the example above, the victim is introduced first). The order of the dilemmas in each set was randomized. Only one set was presented to each participant. No difference of choice frequencies between the sets was found (Fisher's exact test; p=.240 for 'Alien' dilemma; p=.285 for 'Wild animal' dilemma; p=.429 for 'Domestic animal' dilemma; p=.594 for 'Human' dilemma). Therefore, the results of the two sets were combined.

The goal of the study was revealed to the participants when the interviews with all of the children had been completed.

2.3. Research design and procedure

Children were individually interviewed at school in a separate room. First, the experimenter became acquainted with the children and asked them about their families, friends, hobbies, and so forth. Then the children were given moral dilemmas and questioned about each of them. To assess the moral evaluation of aggressor's actions in the dilemmas, the participants were presented with a 5-point Likert-type scale after each dilemma. The ratings ranged from 'very bad' to 'very good' and were labeled with smiling, sad, or neutral faces, as done elsewhere (e.g. Smetana, 1981). The interviews were audio-recorded.

For purposes beyond the scope of this article, we used a wireless device measuring heart rate in 34 participants (3–8 years old,20 female). After moral dilemmas these participants performed other psychological tests (not related to moral development). The moral decisions were not affected by these manipulations (Fisher's exact test, p=.590 for 'Alien dilemma'; p=.430 for 'Wild animal' dilemma; p=.554 for 'Domestic animal' dilemma; p=.288 for 'Human' dilemma). Therefore, both subsets of data were analyzed as a single sample.

2.4. Measures

Participants' choices to help a victim or to help an aggressor were coded as '1' or '0', correspondingly. The average of these (i.e. the frequency of choosing victims) served as an 'index of help' for each participant. The moral evaluations of human actions were coded from 1 ('very bad') to 5 ('very good'). Two average scores were calculated for each participant: evaluations of aggressor's action given after helping a victim were averaged separately from those after helping an aggressor. The frequencies of choices for each dilemma were compared between the groups with Fisher's exact test. The correlations between the index of help, the average evaluation ratings, and age were assessed with a non-parametric Spearman's coefficient. The differences were considered significant at $p<.05$.

3. RESULTS

No gender differences were found in the dilemma scores or the evaluations within either groups or dilemma (dilemmas scores: Fisher's exact test, p=.481; p=.158; p=.613; p=.265; evaluations of actions: Mann-Whitney test, U=767.5, p=.946; U=646.5, p=.202; U=685, p=.345; U=752.5, p=.856 for the 'Alien', 'Wild animal', 'Domestic animal', and 'Human' dilemmas, correspondingly). Therefore, the scores of boys and girls were joined together.

3.1. Moral decisions

The choices made by the participants in each dilemma were presented as frequencies of victim preference (Figure 1). The differences in these frequencies between the groups were revealed in all of the dilemmas, whereas the age of significant increase in preference of a victim increased as the degree of relatedness to the victim decreased – the less related the victim, the later the age of significant increase. Thus, in the 'Human' dilemma, the differences between the scores of the 3–4 and 5–6 age groups were significant (Fisher's exact test; p=.049), as well as between the 3–4 and 7–9

age groups, and the 7–9 and 10–11 age groups (p=.003 and p=.036). The significant increase of victim preference occurred at a later age in the dilemmas with animals, with the differences between the scores of the 3–4 and 7–9 age groups being significant (Fisher's exact test; p=.005 in the 'Domestic animal' dilemma, and p=.025 in the 'Wild animal'), along with the difference between the 3–4 and 10–11 age groups (p=.015 and p=.004, correspondingly). In the 'Alien' dilemma, the difference was obtained between even more distant groups — 3–4 and 10–11 (p=.040), as well as between the 5–6 and 10–11 (p=.019).

Accordingly, significant differences from a random distribution (assessed with Chi-square criterion) were observed in different age groups depending on the dilemma. The distributions of decisions in 'Human' (χ^2=10,67, p=0,001), 'Domestic animal' (χ^2=16,67, p<0,0001), and 'Wild animal' (χ^2=13,5, p<0,0005) dilemmas were different from random in the group of 5–6 year olds), whereas the distribution of decisions in the 'Alien' dilemma became different from random only in 10–11 year olds (χ^2=7,12; p=0,008). However, in the 'Human' dilemma, the decrease of the victim support in the group of 10–11 year olds has lead this difference to the level of tendency (χ^2=2,88; p=0,09). No significant differences were observed in the group of 3–4 year olds.

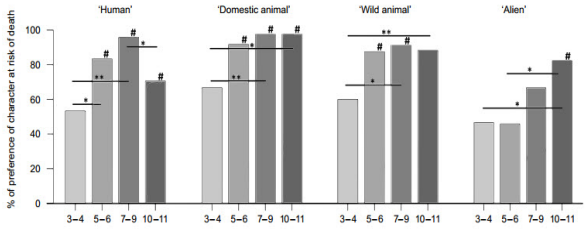

Figure 1. The frequencies of victim support in the moral dilemmas ('Human, 'Domestic animal', 'Wild animal', and 'Alien') for age groups of 3–4, 5–6, 7–9, and 10–11 years old. *Fisher's exact test, p<.05. **Fisher's exact test, p<.01. # Chi-square criterion, p < 0,05.

3.2. Evaluations of actions

Due to technical problems, evaluations from four participants were not recorded. The remaining data had the following group content: 3–4 years (N=15), 5–6 years (N=23), 7–9 years (N=22), 10–11 years (N=16).

The 'index of help' was found to be positively correlated with age (R=0,46; p<0,0001) and negatively correlated with the evaluations of aggressor's actions after helping a victim (R=-0,27; p=0,016; Figure 2), but not after helping an aggressor (R=0,01; p=0,938).

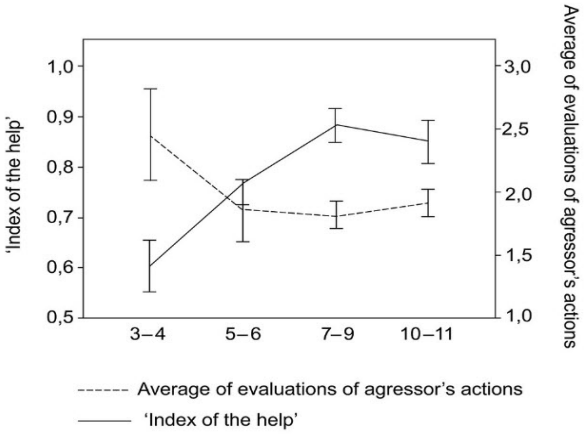

Figure 2. Decrease of average of the evaluations with increase of 'index of help' through ontogenesis. X-line: age groups — 3–4 year olds; 5–6 year olds; 7–9 year olds; 10–11 year olds. Solid line shows the dynamics of 'index of help'. Dotted line shows the dynamics of the evaluations of aggressor's actions (mean values).

The evaluations of aggressor's actions after helping an aggressor were found to be negatively correlated with age on the level of tendency (R=-0,281; p=0,05). We also found a correlation between the 'index of help' and the average evaluation rating for each group taken separately, except the group of 3–4 year olds (R=-.287; p=.299 for 3–4 group; R=-.477; p=.018 for 5–6 group; R=-.686; p<.0005 for 7–9 group; R=-.558; p=.020 for 10–11 group). Notably, children who helped out-group members tended to evaluate human actions as 'bad' or 'very bad', whereas children who helped aggressors tended to evaluate human actions as neutral — not as 'very good'.

4. DISCUSSION

In order to reveal the forms of behavior prerequisite for rule-guided moral judgments we contrasted four age groups with respect to moral decisions. Children aged 3–4, 5–6, 7–9, and 10–11 years were presented with 4 moral dilemmas in which actions of a human who seeks life improvement could result in vital harm to another human, domestic animal, wild animal, or alien – i.e. creatures with different hypothetical genetic and cultural distance to human species. The participants decided whether to support an aggressor, or a victim, and evaluated the behavior of aggressors. The

frequency of helping a victim was found to increase with age, except for the human victim, who was less supported in the group of 10–11-year olds.

The preference of a non-human victim to a con-specific aggressor is considered as normative behavior, which is supported by corresponding disapproval of the aggressor's actions. Therefore, the biologically adaptive strategies of supporting in-group members may be among prerequisites of the rule-guided behavior formed during socialization. We acknowledge that the dilemmas used in this study do not fully correspond to conventional definitions of group and kin within the group-selection and kin-selection theories (West et al., 2007b). However, the interaction rate and the degree of relatedness to other creatures were central to our main propositions, like they are central to these theories. We propose that the group- and kin-selection theories describe different aspects of the same process. Kin selection theory focuses to a considerable extent on how genes influence the development of prosocial and altruistic behavior, whereas group selection theory focuses more on socio-environmental influences.

The age-related increase of the out-group support frequencies observed here reveals specific features of socialization within culture. The trend is consistent with the suggestion of the development of moral attitudes toward out-group members in problem situations. Earlier in the ontogeny, children employ an evolutionarily more ancient behavioral strategy (helping an in-group member), whereas at later evolutionary stages, children acquire and 'internalize' (Vygotski, 1929) moral rules from their cultures (Rest et al., 2000) (in our case, they are presumably based on understanding the value of life). It has been shown that the attitudes toward in- and out-group members differ (e.g., Cunningham et al., 2004; Hein et al., 2010; Rilling et al., 2008). This difference appears early in ontogenesis— for instance, 10-month-old toddlers prefer faces of their race (Kinzler and Spelke, 2011). Presumably, attitudes toward in- and out-group members are formed via moral rules that emerged during phylogeny and can be fixed in genes and culture (House et al., 2013). The preference for unrelated group members may therefore be formed within culture early in ontogenesis but later than the preference for related group members.

The present findings may provide the initial basis for explaining kin selection as reflecting the first stage of altruism and prosocial behavior development in human phylogeny and evidence of group selection as reflecting the second stage. This suggestion is consistent with parochialism being the most ancient type of altruism, as expressed in relation to more relative group members only and associated with hostility to less relative group members (Choi and Bowles, 2007). Altruistic help is more difficult for infants to understand than empathic or instrumental help (Svetlova et al., 2010), because the former requires more cognitive complexity (see also Rest et al., 2000). Moreover, reciprocal altruism appears later in the ontogenesis than altruism toward in-group members in animals (Reznikova, 2011). Therefore, we suppose that the reciprocal altruism (toward out-group members) is associated with the growth of intergroup interactions and the spread of cooperative actions beyond the own group.

Interestingly, the preference for alien victims in our study appears at an older age than the preference for other non-human species (10–11 years old vs. 7–9 years old). The contributing factors to this result may be the enrichment of subjective experience and a dramatic increase in the number of intergroup interaction episodes, as well as the growth of the number and heterogeneity of members of formal and natural groups in modern societies. Similar dynamics in racial attitudes was found by Quintana (Quintana, 1998). Negative attitudes toward people of other races decrease in ontogenesis. We suggest that the development of moral attitudes occurs in the direction from self and closely related individuals toward more distant and unrelated individuals: self, family, race, species, and biosphere are treated as an in-group at successive stages. These 'levels' may have individual duration or scope (see below), but follow the same order.

The evaluation of human actions differed between children making opposite decisions. Those children who helped out-group members evaluated human actions as 'bad' or 'very bad', whereas children who helped humans evaluated human actions as neutral (not as 'good' or 'very good'). We believe that these evaluations stem from children having internalized the moral rules of their cultures and realized the 'immorality', wrongness of the actions of human aggressors. However, children still want to help in-group members due to an unconscious 'relatedness'. Thus, the evaluations demonstrate that genetic and environmental factors interact in the development of altruistic behavior.

If the rule-guided support of the vic-

tim reflects the development of the moral attitudes, then no decrease of victim support was to be expected as the age of the group increases. However, the frequency of support to a human victim in the group of 10–11-year olds was significantly lower than in the group of 7–9-year olds. This decrease was not accompanied by growth in evaluations of aggressor's actions. The oral explanations given after each choice by every participant (analysis not presented here) showed that the 10–11 year-old participants gave significantly more explanations of their choices based on rules and conventions, than participants of the other age groups. Therefore, the decrease of human victim support in the 10–11 age group was due to a more detailed knowledge of human social life, which is also a sign of socialization, but of the type beyond our empirical capacity. The in-group member preferences were evident in all groups, especially the youngest. This ancient moral attitude tempts us to speculate that moral might be under major influence of the 'genetic' factor, whereas interaction with the environment primarily defines the range of application of moral attitude. Thus, every individual expresses moral attitude, but this attitude may not involve certain groups due to specific socialization conditions (Koonz, 2003; Sozinov et al., 2015). According to our results, this range may start adhering new groups of less related creatures as early as at the age of 5–6 years. This suggests that it is important to introduce moral education in early childhood.

Using the terminology of the system-evolutionary principles that inspired our theoretical hypothesis (see Introduction), we conclude that the preference for helping related group members may have emerged within the most ancient systems of individual experience, whereas the preference for helping unrelated group members may have emerged within more recently formed systems.

We consider the results of this investigation as a necessary step to studying moral decisions under decreased social control. The victim support might be less evident, if the dilemmas were presented on an electronic device in absence of a grown-up. As a perspective for future studies, we also propose that dynamics of prosocial decisions may be characterized with intercultural differences. Given that even simple verbal discrimination task performance (Sozinov et al., 2015), as well as social (and moral) decisions in grown-ups (Arutyunova et al., 2013; Simpson and Willer, 2008) differ between cultures, the prosocial behavior may develop in culture-specific ways.

5. CONCLUSION

We have demonstrated that moral decisions in dilemmas confronting in- and out-group members differ between groups of children aged 3 to 11 years old. Older children prefer helping unrelated group members more frequently than do younger children. Conventionally, the prosocial behavior may have emerged either at the earlier stages of evolution and ontogenesis, as explained by kin selection theory, or the later stages, as explained by group selection and other theories of altruism. At the same time, these two descriptions may correspond to consecutive stages of development.

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Conflict of interests

The authors declare no conflict of interest.

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DIFFICULTIES IN MANIFISTATION OF PREDICTIVE THINKING OF PRESCHOOL SENIOR AGE CHILDREN WITH UNDERDEVELOPMENT

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ABSTRACT

The predictive abilities of children are little investigated in cognitive psychology. The results of empirical studies of predictive thinking of senior preschool age children with underdevelopment are presented. The sample group was 6-7 year old children attending kindergarten. There are 18 children with somatic, speech disorders. We used techniques: "Psychodiagnostic complex (PDC)", the method of investigating the peculiarities of predictive activity; the method for diagnostics the level of development of verbal-logical thinking. We used the method of participant observation. We presented the data proving that children with a mental underdevelopment more often make mistakes in predictions and mistakes of distractions, elements alternating, strategies change, classification, which reduces their cognitive efficiency. The results demonstrate statistical relationships between the indicators of the ability to prediction, verbal-logical and visual-creative thinking in children of preschool age. Factors influencing the formation of mental abilities of children are discussed.

1. INTRODUCTION

Any human activity involves prediction. The development of theoretical and practical aspects of the problem of prediction is not only of relevance importance, but also becomes more popular as it is an important aspect of understanding the functioning of cognitive sphere of a man, his sensory-perceptual and intellect processes. Predictive ability of preschool children is a topic rarely found in cognitive studies. The situation is complicated by the fact that the development of cognitive activity of children takes place in conditions of bad environmental situation, social crises and is influenced by different kinds of sensory systems violations. Замбацявичене, Э. Ф. (1984), says that modern children show a sharp decrease in cognitive development. Смирнова, Е. О., Лаврентьева, Т. В. (2008) states that today's preschool children have a sharp decline in imagination and creativity. Children lose their ability and desire to occupy themselves with something. They make no effort to design new games, to make up tales, to create their own imaginary world. The children of today are the children of display, information culture. These children need psychological and educational support, since most of them have not only complex defects, but also difficulties in behaviour and learning, underdevelopment of intellectual-cognitive sphere. Therefore, the problem of studying the individual peculiarities of cognitive sphere of children in preschool educational institutions becomes extremely important.

A child, learning the world, its surrounding reality, as well as a grown person perceives processes and organizes information. Any cognitive activity has a more or less probabilistic forecasting of future events or readiness to perceive, presetting, anticipation. The process of probabilistic forecasting is one of the mechanisms that ensure speed, accuracy of perception of sensory information, its processing peculiarities, and is associated

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with the frequency of occurrence of particular objects or events in the past of a child. All events in a child's life, are linked and fixed in the memory, thereby forming a probabilistic connection between certain events.

The best known researches by Л. А. Регуш deal with the structure of cognitive predictive ability and describe it as a set of mental qualities that determine the success of solving various types of predictive tasks (K. Reichenbach, K. et al, 2016). Another well-known research was done by L. I. Peresleni and other scholars, who studied the connection of predicting processes with the features of main mental functions (voluntary attention, memory, perception, thinking) (Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., 1990). An interesting research was carried out by Менделевич, В. Д., Менделевич, Д. М. (2009), who argues that predictive (anticipatory) abilities have personal and situational, spatial and time components and are developed in an advisory and training mode.

2. MATERIALS AND METHODS

The objects of the research were senior preschool children aged from 6 to 7 years. According to the results of the questionnaire children were divided into two groups: a correctional group, or a group of children with delays in mental development (18), and an educational group, the level of mental development of children corresponds to the age norm (33). In the questionnaire the psychologist recorded the results of a child observation and the information provided by the kindergarten teachers. The items under consideration were: the difficulties of behavior and learning; the peculiarities of emotional-volitional sphere and attention; the peculiarities of a child cognitive activity; violations in the motor area; the existing impairments of hearing and vision; reactions, detected during the surveys; attitude to success and failure in the process of task execution; as well as other features of behavior, character, cognitive activity (if there are any). The obtained data allowed to make a more complete portrait of the surveyed preschool child.

The main research methods were: observation, interview, psychological diagnosis. As methodological tools we used psych diagnostic methods included in "Psychodiagnostic complex (PDC)", developed and probed by Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., (1990). The complex allows to reveal the peculiarities of individual development of cognitive activity of a child: questionnaire, giving information to analyze the condition of the child at the time of the survey, the peculiarities of behavior and cognitive activity. We also used the method of research peculiarities of predictive activity "Ugadaika", developed by Pishchik, V. I., Molokhina, G. A., 2016; the method for diagnostics of development level of verbal-logical thinking, designed by Belousova, A. K., Pishchik, V. I., 2015 based on the verbal subtests of R. Amthauer and modified by Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., 1990; the method with the use of split pictures, developed by Л. И. Переслени, О.И. Шурановой (Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., 1990). To determine the significance of differences we used non-parametric U-criterion by Mann-Whitney.

3. RESULTS

The analysis of the thought processes peculiarities of the senior preschool children, conducted on the basis of empirical data showed the following. Indicator I " predictions mistakes" shows the number of mistakes made by the subjects in the predicting process, in order to detect rotation elements of the second and third sets separately. This indicator reflects the child's ability to hold in the memory his predictions, to compare them with the order with the elements and make conclusions about the sequence of letters. Low efficiency of prediction correlates on the one hand with the processes weakness of capturing information, on the other - with the shortcomings of voluntary attention and in particular with bad allocation. Children in correctional group make "predictions" mistakes in the process of forecasting more often than children in educational group ($U = 178{,}500$, $p \leq 0{,}05$). It is more difficult for them to hold in memory their predictions, to compare them with the order of the elements and make conclusions about the sequence of letters. According to the results of the research Переслени, Л. И., Мастюкова, Е. М., Чупров, Л. Ф., (1990) low efficiency of the prediction is correlated with the weakness of the processes of capturing information and with the insufficiency of voluntary attention, in particular with bad allocation.

The diagnosis results are presented in Figure 1.

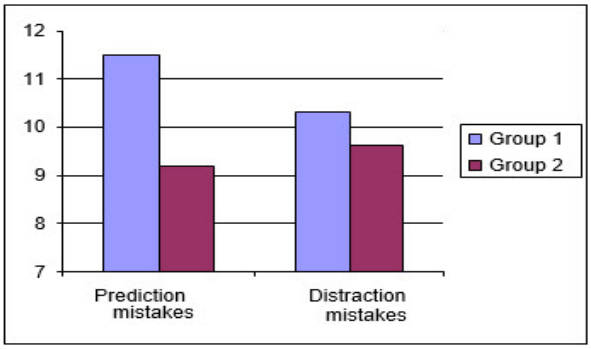

Figure 1. Mistakes of prediction and distraction made in the forecasting process by preschool children

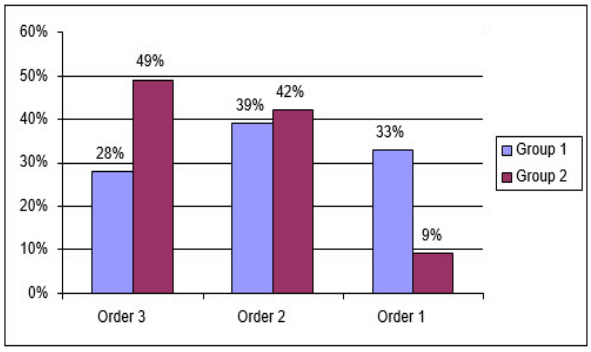

Figure 2. The success of reproduction of elements sequences in the forecasting process of preschool children in percentage

This indicator reflects the level of development of regulation processes affecting the efficiency of predicting activity. These mistakes reflect mainly the stability of voluntary attention. "Distractions" mistakes indicate that even short 10-15 minutes survey, that has a game character, low level of selective attention, adversely affects the efficiency of information processing (Переслени, Л. И., Подобед, В. Л., 1982. p. 10). Mistakes indicator of "distraction" is slightly higher in the children of correctional group than in the educational group. In other words, there is not a significant difference in the level of development of regulation processes, the stability of voluntary attention, influencing the effectiveness of predictive activity in the children groups. However, the presence of "distraction" mistakes reduces the efficiency of information processing (Wu, L. Y., 2016).

Analysis of the indicator "reproduction", which gives additional information about the features of the long-term memory, due to the state of "read" the information mechanisms and important for effective predictive activities, showed that the children of correctional group worse reproduce the sequence of elements in three sets than the children in educational group ($U = 124{,}500$, $p \leq 0{,}05$). In the correctional group, 28% of children reproduced all three sequences of letters, 39 % of children reproduced two sequences, those were mostly the sequences of the first and second sets of letters and 33% of children reproduced one sequence of letters. In the educational group 49 % of children reproduced the three sequences, 42% of children reproduced two sequences and 9 % of children – one sequence of letters. The results are presented in Figure 2.

Indicators II and III allow to approach indirect and direct characterization of the efficiency of memorizing and storing information in the register of short-term memory, on the one hand, and reproduction of information that came for storage to the long term memory, on the other hand. The difficulty in reproducing the sequence of earlier correctly predicted elements may indicate a violation of neurophysiological mechanism, which provides directional "reading" of information from memory (Переслени Л. И., Рожкова Л. А., 1990).

The analysis of the strategies that were chosen by the children in educational activities, providing an active perception of the information showed that the correctional group of children is dominated by rational strategies or change strategies, in the educational group of children rational strategies dominate. Rational strategies contribute to the selection of relevant information and the detection of order of receiving various and important signals. They are formed in ontogeny and depend on the level of development of higher mental functions. Children in the correctional group often use the change of strategies or at random predictions, representing a form of ineffective forecasting of cyclic sequences, when the probability to identify quickly the sequence of elements decreases. The least rationally – occasionally predictions of letters, without regard to the right or wrong previous predictions.

The child's use of rational strategies increases the likelihood of a successful solution of the forecasting task, which is combined with a small number of incorrect predictions. This realizes the possibility of forming generalizations in order to detect the principle of alternation of the elements in the set. In these cases, asymmetric sequence III set is reproduced with fewer incorrect predictions than the symmetric sequence II set.

The result is presented in Figure 3.

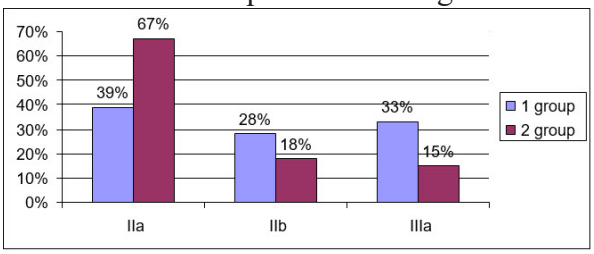

Figure 3. Predictions strategies typical for preschool children in percentage

Change of strategies is one of the forms of inefficient forecasting of cyclic sequences. This decreases the likelihood of rapid identification of the sequence of elements. The least rationally – occasional prediction of letters, without regard to right or wrong in previous predictions.

In the process of research of features of verbal-logical thinking, we have found out that there are differences in the level of development awareness, ability to abstraction, reasoning by analogy, the ability to generalize in children of groups 1 and 2 (Table 1). These differences are reflected in Figure 4.

Table 1. Features of the verbal-logical thinking in children of senior preschool age

Group	The average value, points				
	Awareness	Abstraction	Reasoning by analogy	Generalization	Indicator of success
1	3,7	6,6	3,1	3,6	17,0
2	3,9	7,5	3,8	4,0	19,2
Mann-Whitney Criterion	432,000	295,500	252,500	405,500	273,500
Level of statistical importance	0,312	0,043*	0,035*	0,243	0,039*

* differences are significant at $\rho \leq 0,05$

** differences are significant at $\rho \leq 0,01$

The children of Group 1 have lower values on indicators of verbal-logical thinking than the children in the 2nd group.

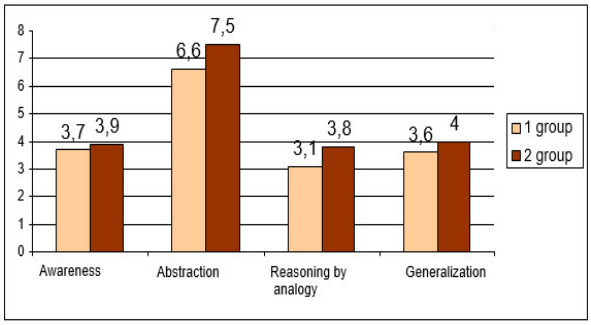

Figure 4. Indicators of verbal-logical thinking in preschool children

In terms of awareness children of both groups, have some difficulties of implementing logical choice based on inductive thinking, the existing stock of knowledge and understanding. There were not significant differences in the groups.

The analysis of formation of logical action (classification), ability to abstraction, has shown that children of the 1st group less successfully distract from occasional and minor signs, from the usual relationship between objects and are able to use this mental technique as classification. Children of Group 2 handle the tasks more successfully. These differences are significant ($U = 295,500, \rho \leq 0,05$).

Children of the 1st group on average worse establish logical connections and relations between objects. The formation of logical action, "reasoning by analogy" is also higher in Group 2. These differences are significant ($U = 252,500, \rho \leq 0,05$).

The indicator of formation of generalizing concepts is above average in both groups of children, in some cases summing up the two concepts under a common category – a generalization, causes the problem. The differences are insignificant.

The indicator of success of solving the four verbal subtests (in percentage) that we calculated on a formula, is higher in Group 2 than in Group 1 where children badly coped with the solution of verbal tasks (Figure 5). Differences are significant ($U = 273,500, \rho \leq 0,05$).

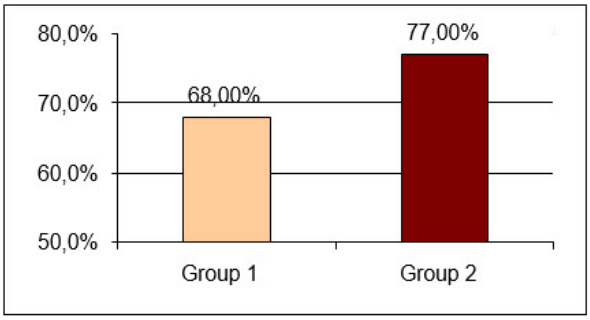

Figure 5. The success indicator of verbal-logical thinking in children of senior preschool age

Thus, the analysis of indicators of the verbal-logical thinking allowed to establish that the overall level of development of verbal-logical thinking is low in Group 1. Children in Group 1 have certain difficulties with verbal tasks, which are based on the ability to abstract, find reasoning by analogy and the ability to generalize, which affects the indicator of success of verbal-logical thinking.

The study of features of visual-creative thinking showed that there are differences in the level of development of visual-figurative thinking of preschool children of Groups 1 and 2 (Table 2). These differences are reflected in Figure 6.

Table 2. Features of visual-figurative thinking in children of senior preschool age

Group	The average value, points		
	Butterfly	Cock	Success level
1	6,9	8,2	15,1
2	7,8	8,5	16,3
Mann-Whitney Criterion	153,500	260,000	162,000
Level of statistical importance	0,041*	0,452	0,048*

* differences are significant at $\rho \leq 0,05$

** differences are significant at $\rho \leq 0,01$

Pictures were shown to the children in ascending orderof difficulty. Collecting the first picture of the "Boy" – was an easy task and we used it to acquaint with the assessment process. As a rule, the children successfully coped with the implementation of this task. Its results did not affect the quantification of the level of development of perceptual operations and visual forms of thinking; therefore, they are not presented in Table 4.

Task № 2 "Butterfly" represents the original picture. In this task, as in the first one, there is a sign of symmetry that facilitates the child's orientation in the task. On the whole, children in both groups successfully coped with this task, however, the number of children solved the task with the second and third attempts is higher in Group 1. The results are presented in Figure 6.

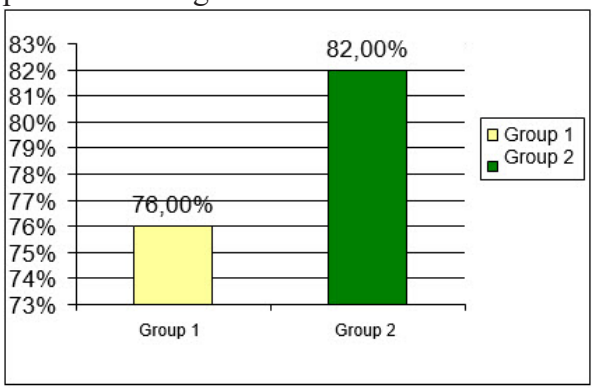

Figure 6. Success level of pictures collecting by preschool children

Task № 3 "Cock" is more complex than the previous two ones. The difficulties of collecting the picture are in the irregularity of its cut lines into pieces, i.e. contrary to the usual division: head, torso, legs etc. Children of both groups quite successfully coped with the implementation of this task. Children who had problems with this task, used the second and the third attempt in the process of pictures collecting and asked for different types of assistance:

1) indicating the mistake of the solution providing the possibility of more attempts (stimulating help);

2) presentation of the image of the whole object, the picture, that needs to be collected;

3) presentation of the image which is cut into parts (dissected sample);

4) picture collecting by overlapping parts on the dissected sample.

On the whole, it should be noted that the level of development of visual-figurative thinking is slightly higher in Group 2 than in Group 1. These differences are significant (U = 162,000, $\rho \leq 0,05$).

The conducted correlation analysis showed correlations between indicators of the ability to prediction, verbal-logical and visual-figurative thinking in children of preschool age and the results are presented in Table 3.

Table 3. Correlations of indicators of predicting, verbal-logical and visual-figurative thinking in children of preschool age

	Awareness	Abstracting	Reasoning by analogy	Generalization	Success indicator of verbal-logical thinking	Visual-figurative thinking
Prediction mistakes	-0,423(*)	-0,490(*)	-0,575(**)	-0,425(*)	-0,487(*)	-
Distraction mistakes	-	-	-0,435(*)	-0,442(*)		-
Reproduction	0,395(*)	-	0,586(**)	0,423(*)	0,340(*)	0,401(*)
Visual-figurative thinking	-	-	0,349(*)	-	-	-

** Correlation is significant at the level 0,01
* Correlation is significant at the level 0,05

On the basis of the results, we constructed the correlation Pleiades, allowing to reflect the correlations vividly on the pictures 7, 8, 9, 10.

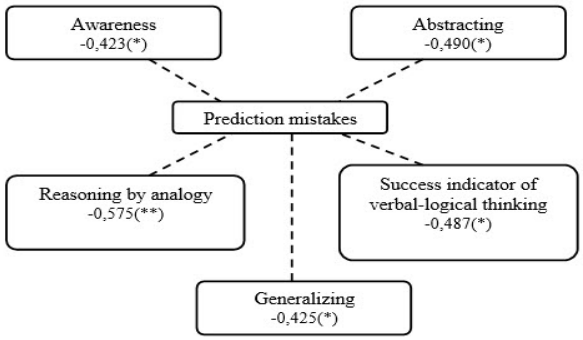

Figure 7. Correlation of prediction mistakes and indicators of verbal-logical thinking in children of preschool age

The indicator of ability to forecast the "prediction mistakes" has a negative correlation with the following indicators of verbal-logical thinking: abstracting (r = - 0,490, when $\rho \leq 0,05$); awareness (r = - 0,423, when $\rho \leq 0,05$); reasoning by analogy (r = - 0,575, when $\rho \leq 0,01$); generalization (r = - 0,425, when $\rho \leq 0,05$); total indicator of success of verbal-logical thinking (r = - 0,487, when $\rho \leq 0,05$).

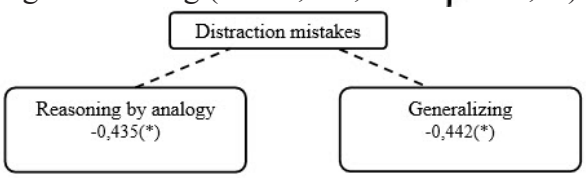

Figure 8. Correlation of mistakes of distraction and indicators of verbal-logical thinking in children of preschool age

The indicator of the ability to prediction of "distractions mistakes" has a negative correlation with the following indicators of verbal-logical thinking: reasoning by analogy (r = - 0,435, when $\rho \leq 0,05$); generalizing (r = - 0,442, $\rho \leq 0,05$).

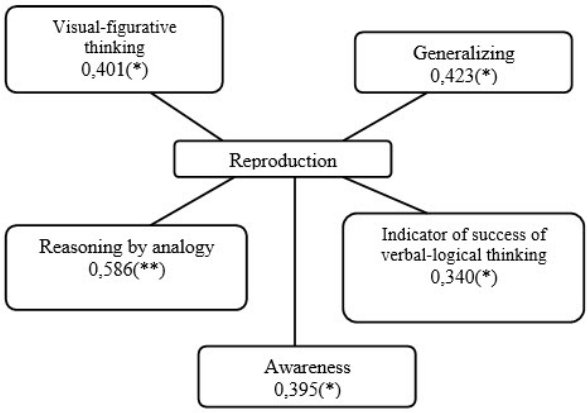

Figure 9. The correlation of reproduction and indicators of thinking in children of preschool age

The indicator of the ability to predict the "reproduction" has a positive correlation with the following indicators of verbal-logical thinking: awareness (r = 0,39, when $\rho \leq 0,05$); reasoning by analogy (r = 0,586, $\rho \leq 0,01$); generalizing (r = 0,423, when $\rho \leq 0,05$); the indicator of success of verbal-logical thinking (r = 0,340, when $\rho \leq 0,05$); visual-figurative thinking (r = 0,401, when $\rho \leq 0,05$).

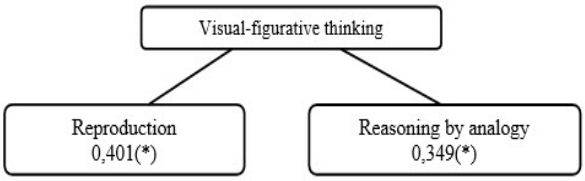

Figure 10. Correlation of visual-figurative thinking, indicators of forecasting and verbal-logical thinking in preschool children

Visual-figurative thinking correlates positively with the indicator of verbal-logical thinking "reasoning by analogy" (r = 0,349, when $\rho \leq 0,05$) and the indictor of ability to predict "reproduction" (r = 0,401, when $\rho \leq 0,05$).

Thus, the prediction mistakes and distraction mistakes in the forecasting process have a negative correlation with indicators of verbal-logical thinking (awareness, abstraction, reasoning by analogy, generalization). Preschool age children are characterized by the following phenomenon: the lower is the level of verbal-logical thinking; the more is the number of mistakes.

Reproduction the order of three sets elements sequences after their last presentation positively correlates with such indicators of verbal-logical thinking as awareness, reasoning by analogy and generalization, the success indicator of verbal-logical thinking and visual-figurative thinking.

4. DISCUSSION

The difficulty in predicting will slow down the processes of socialization in children. As it is shown in the study of Shiyan, O. A., Kokontseva, E. V. (2014) there is a statistically significant correlation of the child's ability to use dialectical thinking, and such components of interaction with colleagues as the ability to cooperate and the ability to behave independently. This affects the development of his style of thinking in the future (Belousova, A. K., Pishchik, V. I., 2015).

Numerous studies show that in normal (Passolunghi, M. C. et al, 2015; K. Reichenbach, K. et al, 2016) and abnormal development of a child's intellectual abilities a great role is played by his level of memory development and nonverbal intelligence (Pishchik, V. I., Molokhina, G. A., 2016; Valencia-Naranjo, N., Robles-Bello, M. A., 2017).

It is also stressed that of great importance for the development of strategic thinking is the inclusion of mental action in a game, drawing, free time activities (Pishchik, V., 2014; Wu, L. Y., 2016).

It is possible to highlight cross-cultural aspect of the problem of forming of cognitive abilities in children of preschool age. Here cultural context is of great importance (Cole, M., 2003; Мацумото Д., 2003). In some cultures, parents suppress cognitive activity of children, in other cultures on the contrary they encourage it (Мацумото Д., 2003; Pishchik, V., 2014).

Thus, preschool children can improve their predictive abilities when the operations of forward-looking thinking will be included in games, educational and free activities in the kindergarten and they will be supported by adults.

5. CONCLUSIONS

The empirical study of peculiarities of mental processes in children of preschool age in the correctional group and in the group with the development corresponding to the age norm leads to the following conclusion:

1. Children of Group 1 (correctional) are characterized by:

- the average efficiency of the prediction and lower level of development of regulation processes affecting the efficiency of predictive activities, make significantly more often predictions mistakes and distraction mistakes in the process of forecasting activity than children of Group 2;
- reproduce worse the sequence of elements in three sets than the children of Group 2;
- in terms of prediction of the letters sequence often use strategies change (form of inefficient forecasting) or random predictions, which is not typical for children of Group 2.

2. In Group 1 the level of development of verbal-logical thinking is lower than in Group 2.

3. In Group1 the level of development of visual-figurative thinking is lower than in Group

4. The conducted correlation analysis showed correlations between indicators of the ability to prediction, verbal-logical and visual-figurative thinking in children of preschool age:

- the prediction mistakes in the forecasting process negatively correlates with indicators of verbal-logical thinking (abstraction, awareness, reasoning by analogy, generaliza-

tion) and the total success indicator of verbal-logical thinking;

- the distraction mistakes in the forecasting process negatively correlates with indicators of verbal-logical thinking (reasoning by analogy and generalization);

- the reproduction indicator positively correlates with indicators of verbal-logical thinking (awareness, reasoning by analogy, generalization), with the success indicator of verbal-logical thinking and visual-figurative thinking;

- indicators of verbal-logical thinking positively correlates with visual-figurative thinking.

5. Based on the obtained data we proposed the program of development of prediction abilities of preschool age children and gave recommendations to the leadership of the children's educational institution.

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Conflict of interests

Authors declare no conflict of interest.

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VISUAL PERCEPTION SPECIFICS OF CHILDREN WITH ASD AS A DETERMINANT FOR EDUCATIONAL ENVIRONMENT OUTLINETIMES

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learning environment,
design.

ABSTRACT

The idea of inclusive education raises the question of security of children with autism spectrum disorders (ASD). It is the imperative of the time to create teaching materials that promote the effective implementation of educational curriculum. However, we have to stress the fact that most of the evaluable nowadays teaching materials have been created spontaneously, without any reliable criteria. Our primary hypothesis is that children with ASD have specific features of visual perception that do not depend on the state of their intelligence, which is confirmed by empirical data obtained by the authors. Our secondary hypothesis, specified in the process of research, stipulates that children with ASD will differently perceive different graphic images executed in different styles. These findings are further confirmed by empirical data collected by the authors in the study of perception and understanding of different graphic images by children with ASD and mental retardation. On the basis of theoretical and empirical data we specified the criteria for graphic design products which play a pivotal role in the formation of school educational environment. In this respect we focus on the criteria for design materials (including design criteria provisions, formulated by Norman, which he addressed to practicing designers).

"Humanity is going blind, accepting at "word value" the whole visible world, the mankind forgets to fully comprehend the messages coming through their eyes ... The child, due to some preserved atavism, is still able to perceive the "strangeness", "difference" of world items. However, when the child makes the first step to school, this preserved atavism is replaced ulation of life"

Kuzma Petrov-Vodkin, Russian painter. 1917.

1. INTRODUCTION

Autism spectrum disorders are defined as a group of disorders that hamper the normal human interaction with the surrounding environment. More recently, autism was considered an extremely rare disorder: it was diagnosed in one child out of 20 thousand (Ivanov et al. 2004). However, since the mid-1990s the number of such children has been increasing rapidly and today the ASD rate is close to 1.5%, and according to some sources currently ASD occurs in 1 out of 68 children (Kim et al. 2011).

Children with ASD have pronounced peculiarities of communicative sphere, as well as stereotyped behavior with limited inclinations and interests and difficulties of social interaction (Nikol'skaya et al. 2010). In addition, one of the characteristic features of this category of children is the specificity of visual perception and understanding of the world, which, of course, should be taken into account in the organization of their learning process. The answer to the question of how

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these children understand the world around us, how they interpret incoming signals, will help create special manuals for them, resulting in contribution to their more successful learning and facilitation the work of the teacher. This makes the current scientific-developed approach to the design of textbooks, manuals, educational games a principal determining factor. Meanwhile, the problems of vision and control of communications of children with ASD are studied insufficiently. These problems are important both in terms of cognitive processes in general and specific practical recommendations for designers of educational and methodological materials (Bystrova and Tokarskaya, 2016a, 2016b).

Our findings cannot be regarded as complete. We've accumulated and processed special psychological data regarding the perception and communication of people with ASD. These data were confirmed by preliminary empirical research, which defined evaluation criteria and conceptual parameters of the final product. Consequently, generally submitted data will allow designers, who often work spontaneously, implying associations or observations without any regular sufficient scientific evidence, to identify specific criteria and means of expression. It is necessary to overcome the subjectivity and arbitrariness of design, because design is able to compensate a person with ASD many things that he/she cannot actively take from life.

Eventually in the article we put forward two hypothesis, the first one is that children with ASD have specific features of visual perception that do not depend on the state of their intelligence, which is confirmed by empirical data obtained by the authors. And the second hypothesis, specified in the process of research, stipulates that children with ASD will differently perceive different graphic images executed in different styles.

2. MATERIALS AND METHODS

The study is based on a cognitive approach (Anderson 2002; Kant 2015), considering the cognitive processes and mechanisms of knowledge acquisition as information processes, as well as a central element of active human psyche. Despite the lack of consensus among Western cognitive scholars (Lindsay and Norman, 1974) and Russian experts (Gal'perin 1999; Leont'ev 1959; Rubinstein 2002) on the question, regarding the essence of cognitive processes, we isolate a number of important propositions, which further may be projected into a picture of the mental life of a child with ASD. We find it necessary here to stem from the following propositions.

- The decisive role in cognition, including cognitive processes in education, belongs to active person's actions in addressing certain issues or problems (Kant 2015; Kelly 2000a; Anokhin 1971; Naysser 1981; Allakhverdov 2000). Automatisms and repetitions are not as effective as the active person's actions. This thesis gives us an epistemological foundation for the problem formulation about visual images' interpretation in front of the children, whose development we are interested in. Automatism simultaneously decreases heuristic value of the data by means of simple repetitive actions of the child.

- A person's ability to process stages (Luriya 2011) and synthesize data about the world obtained through knowledge, is based on his/her past experience (Solso, 2006). Psychic unit of information is stored in long-term memory and controls individual actions. This unit is packed into a frame, which we define as an integral individual stage of reality, connected by a system of "addresses" and "links" with other frames (see connectionism theory, proposed by Siemens 2008; Downs et al. 2004). The isolation of these frames in the analysis of multiple images gives an idea about the known or dominant structures that become the basis for the development of visual images for learning and teaching materials.

- The ability to explore and even measure these processes is based on the analysis of psychophysiological, neurophysiological processes (Tulmin 1984; Donald Norman 2002; Naysser 1981; Anokhin 1971; Bernstein 2000; Zabrodin and Lebedev 1977). This position makes it necessary to use psychophysiological tools, such as the eye tracker in post-project analysis of graphic materials that we plan in the future.

Substantial assistance in the investigation of the issue was found in the papers by psychologists and cognitive scientists, designers and practitioners of visual perception (Itten 2011; Zinchenko 1997; Rauschenbach 2002). It should be noted that Russian psychology offers less rigid disciplinary boundaries, leading to a greater variety of versions of cognition within the cognitive approach.

The closest to us, in terms of further practical application, are the representative cognitive approach ideas in design, formulated by the American theorist Donald Norman (2002, 2013). In particular, Norman and

Norman (1988) introduced such indicators of cognition, based on human design, as the information content / clarity / intuition; emotion, aesthetics (Norman, 2002). As specified in the empirical studies of visual processes of children with ASD, these characteristics may further be developed into the criteria for professional evaluating of design products.

In this paper we, firstly, analyzed the features of the interaction of children with ASD with the environment and other people, including the visual perception parameters, we derive from the primary design criteria. Secondly, we conducted the research of perception features and understanding of a variety of graphic products for children with ASD and mental retardation. In view of these data, we formulate recommendations for graphics products. All this is necessary to create a pilot version of a special graphical educational product for children with ASD, as well as its testing and adjustments in the Ural Federal University (Ekaterinburg, Russia).

3. RESULTS AND DISCUSSION

3.1. Results

Eventually, proceeding from the results of the study, we assume that visual perception of children with ASD is more influenced not by their intellectual level, but, above all, by the severity of their autistic features, what explains the similarity of received results with the results of other researchers.

We offer a number of recommendations for the design of manuals for children with ASD:

1. The "conceptual model" (Norman 2006) of a specific product should take into account the cognitive features and models of interaction with the subject, typical of children with ASD. Designers have to move away from publishing standards. "A good conceptual model is the line between the right and wrong use of many things" (Norman 2013). For example, when fixing unintentional vandal actions against a book, it can be envisaged to make the book from more economical disposable materials. Another option that corresponds to Norman's idea of "perceiving purpose" is connected with distraction of the child's attention from unacceptable actions with respect to the projected object. It can be done again at the expense of texture, color, layout and design features.

2. The understanding of the educational model for which a particular project is being implemented can be an essential aid for the designer. For example, L. Vygotsky's "developmental training" and the idea of social constructivism makes it possible to create a stylistic or image structure that is isomorphic to the structures of the life of a given individual or group of children in order to activate internal dialogue. They can be variably repeated when displaying different objects. Of course, in this case the designer cooperates with the teacher, and not only with the child.

3. The depicted object should be specific and realistic enough, but not necessarily highly detailed (insofar as it cannot be confused with something else - a cat with a fox or a squirrel, etc.). It is rather a question of the "coincidence of codes" (Anokhin 1971) of the artist and the perceiver. It is necessary for the child to catch the sense of the image in that short period of time when his attention is productive and does not bring a different meaning to the depicted subject. Stroking shapes and objects with a black line is one way to achieve greater clarity of the figure, relative to the background. More abstract symbols do not contribute to this, but this is still a hypothetical statement which has to be further tested separately.

4. The background plan should be executed as simply as possible, so as not to interfere with the perception of the main image. It can have a planar character and cannot contain elements that enhance the perspective effect.

5. The color scale should not be necessarily obscure. If the depicted object is bright and by contrast stands out against the general background, it will contribute to the perception of the child. At the same time, one should take into account the possibility of rapid emotional overload of the child and, if necessary, obscure tones or "watercolor" tones can be given in bleached, background colors.

6. The attention of the child is strengthened by the interest in the depicted object. This can be facilitated by textural, sound, aromatic and other inserts in the book, significantly increasing its production cost, which is sensible in special cases.

7. If the illustrations in the manual become embossed, the child will find it easier to focus on the information received and will take it more fully. The book should give an idea of the object so that as many sensory organs as possible can be activated, which will allow to achieve a polysensory effect.

8. It is necessary to take into account the scenario of interaction with the object – both in cases of a child's individual work or the

work with a tutor, teacher, parent, i.e. someone who activates the contact and pays attention to the individual elements of the image. The included observation shows that children with ASD often repeat movements of adults. This observation can be used in the development of such educational teaching materials, as handwriting manuals, primers, etc.

9. It is necessary to carry out postproject research of the publishing product using the method of focus groups, and further to correct the image, zooming on the more frequent reactions of children with ASD.

3.2. Visual perception features of people with ASD

In the scientific literature there are various, often conflicting data about the features of the processing of visual information by people with ASD. These data are very scattered and sometimes contradictory, so the first priority is their generalization and systematization.

A phenomenal ability to process visual information by people with ASD is exemplified in the description given by the American professor Temple Grandin (who herself is an adult woman having an autism spectrum disorder, whose autistic features she managed to overcome), "... My thinking is purely visual. ... I happened to design large and complex agricultural systems, but to remember a phone number or to add two numbers is a challenge for me. If I want to remember something abstract, I visualize it as if I "see" the information I need on a page from a book or a notebook and then "read it out" from there... To remember something heard, I need it to be emotionally loaded or connected with some visual image "(Grandin and Skariano, 1999, 221). However, this level of activity, even the dominance of visual thinking is not typical of all people with ASD, and it is unlikely that these data can be used for publishing design for children with ASD of all categories.

The variety of visual perceptions is further exemplified in the data by Lebedinskaya and Nikol'skaya. They call it "a look through the object", resulting from a lack of eye tracking of object, or "pseudo blindness". For ASD people it is necessary to focus their views on a "pointless" object: a light spot, a shiny surface area, a pattern of wallpaper, carpet, flashing shadows. Such people are spellbound with such contemplation. ... However, they exhibit early color discrimination, the interest in drawing stereotyped patterns" (Lebedinskaya and Nikol'skaya, 1997, 119-120). Positive perception of simple patterns and ornamental fig-ures may suggest useful tricks for a graphic designer, who is doing the design of book surfaces, exercise books and other educational materials. However, it is important to clarify these ideas in the postproject analysis by means of interviews and focus groups surveys of users of such design products.

Thus, the visual culture (Zinchenko 1997) of people with ASD varies greatly. A number of circumstances have to be taken into consideration in connection with these ideas, i.e. a person with ASD may have a difficulty associated with the treatment, understanding and responding to information coming from the sensory organs. Symptoms of autism may include such features as a lack of eye contact, viewing luminous or moving objects, fleeting glances, a look to the side and a difficulty with a long eye contact, as well as sensory integration difficulties (Lebedinskaya and Nikol'skaya, 1997; Lebedinskaya 1997; Nikol'skaya et al. 2010; Lebedinskiy et al. 1990).

Many people with ASD are "visually defensive." A "visually defensive" person avoids contact with a particular visual information, and may be hypersensitive to it. Individuals with ASD have difficulty in retaining the look and often use continuous scanning of visual information in an attempt to understand its significance.

Since the visual system is related to the motor, cognitive and speech development, in case of violation of the visual information processing, some disorders may arise in these areas (The animals vacation, 1964).

It should be noted that children with ASD in their development are generally less attentive to the people, and many social interactions (Dawson et al. 1998; Dawson et al. 2004; Siemens, 2008). They are characterized by a rare or abnormal eye contact (Dawson et al. 1998; Sigman et al. 1986).

In connection with this thesis, we proceed to the description of the following experiment. Researchers at Caltech have shown 700 different pictures in three seconds. The scientists used a special device that reads eye movements, a fixed region on the picture, to which people paid attention. The right image shows the trajectory of view of persons with ASD, and the left – the view of "ordinary" people (Figure 1). The red zone which corresponds to the most viewed locations, shows that individuals with ASD focus their attention in the center of the frame. When they see a person, then look the other way (Eti izo-

brazheniya pokazyvayut, kak autisty vidyat mir [These images show how autistics see the world]).

Figure 1. The trajectory of view of people with ASD in comparison to the look of "ordinary" people.

This point must be taken into account by designers to create any anthropomorphic products: portraits or images of people. They cannot "impose" a person with ASD a normal person's attention focus.

3.3. Specific characteristics of visual perception of people with ASD (methods, research procedure and discussion)

In this part of the paper wo proceed to the analysis of our own research results and the studies' results, obtained by Kostin (1997).

The need for our own study was dictated by the fact that "the majority of people with autism also have moderate or severe mental retardation (60 % of people with ASD have IQ level which is below 50) (Piters, 1999). There is a need to clarify the features of their visual perception. Of particular interest is the understanding of children's vision of books, first of all, the images in books, for it is the essential basis for maintaining educational process at school.

Our study was conducted in October 2016. The aim of the research was the identification of universal criteria for illustrations' guidelines, which may be of assistance for special manuals targeting children with ASD. The study was conducted on the basis of the state educational institution of Sverdlovsk region Yekaterinburg school № 4. A total of 10 children, aged from 7 to 17 years, took part in the experiment. Among the participants there were 3 girls and 7 boys, among whom there were 3 nonspeaking children.

The study was conducted individually with each child; in the course of the experiment each child was given a set of technically different images. The selection of illustrations was based on the principle of maximum similarity of visual techniques used by people with ASD (the analysis was based on more than 100 images executed by people with ASD), as well as with the above mentioned features of perception and understanding. In the course of the experiment we developed a number of innovative approaches. For example, the knowledge of the "visually defensive" process led us to the idea to limit demonstration of pictures only to the pictures with images of full face and eyes, directed beyond the artistic reality. The understanding of the nature of ornament (Gerchuk, 1998) in comparison with the tendency of people with ASD to create simple patterns led us to use images that were mostly two-dimensional, rather than three-dimensional. "Gestalt" nature of perception and the "field dependence" demanded from us to select images with prominent large-scale central characters.

The illustrations were presented to children on a tablet. All images were divided into three groups which were as follows:

- the illustrations by G. Spirin (В сказочном царстве. Иллюстратор Геннадий Константинович Спирин [In the fairy-tale kingdom. The illustrator Gennadiy Konstantinovich Spirin]), carried out in the most realistic style, with a high degree of detail of the basic figure, but with the planar backgrounds devoid of prospects;
- the specially stylized illustrations with a tendency to planar painting by Vasnetsov (Виктор Михайлович Васнецов - биография и картины [Viktor Mikhailovich Vasnetsov - biography and pictures]);
- other illustrations (the ones which chil-

dren accidentally marked as recommended by teachers, etc.).

In the study, we encountered a number of difficulties in receiving feedback, namely:

- children with ASD were completely different in the level of their involvement, as well as their response to the researcher, their interest in the study, which at times amounted to complete unwillingness to participate in the initial stages of research;
- some children were speechless, or observed the autonomy of speech (words were not connected with the research activity). In addition, many children slurred speech, put in echolalia, individual words, provided monosyllabic answers;
- some children were attracted just by the process of changing pages and flashing images, rather than viewing and discussing them;
- the tablet itself sometimes could become more attractive as an object of manipulation, rather than the images;
- we uncounted a number of difficulties in the diagnosis of children's visual preferences, as the children themselves did not express their emotional attitude to the presented figures, they did not indicate what they liked better;
- in the course of the study the children were often selfabsorbed, they were barely included in the experimental procedure;
- non-verbal children could only point at the object, which was recommended by the researcher. Such procedure skewed the results, as it was not known, whether the child would have outlined the items himself, if the item hadn't been recommended by the researcher;
- we faced errors in object naming due to the children's intelligence specifics: they called a castle a house, Thumbelina a doll, a balalaika a scraping;
- children did not describe the picture as a whole, they simply listed depicted items. They described the pictures in telegraphic style, i.e. "pig, house, smoke," "bear, night, three Christmas trees";
- children's attention was hard to get. Once attracted, it was quickly lost.

As a rule, while sequential viewing, the children called details of the image from top to bottom, however, the more common situation was when the children only named the main elements of the image. Often there was a sense that children did not watch the pictures carefully, they could only point out general ideas, generated from these figures.

In the study by Kostin (1997) there participated 9 males (13-20 years of age), the state of their intelligence was not specified.

Based on the results, there was an attempt to determine the features of a glance position in the design of objects related to the surrounding environment. Kostin (1997) described them as follows.

1) Low information resistance. From the birth a child with ASD has a difficulty with focusing on anything in particular (Что в душе аутиста, беседа с Ирис Йохансон [What is in the soul of an autist, a conversation with Iris Johanson]), or one person to create a natural atmosphere of contact. Therefore, "the one who wants to communicate with an autistic child, must increasingly focus his attention, to create this contact atmosphere" (Chermenskaya, 2014) (Figure 2).

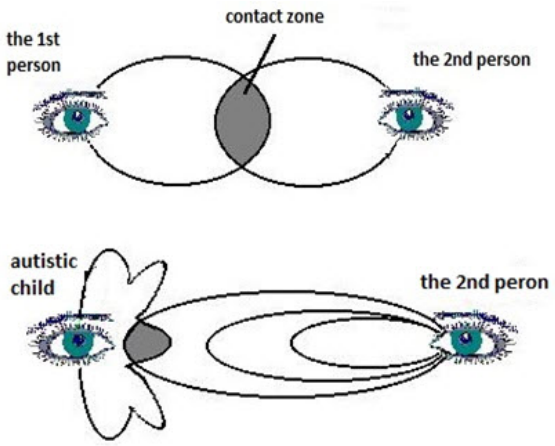

Figure 2. The diagram of communication of a "normal" person as distinct from people with ASD. Source: Chermenskaya, 2014.

Some of the people with ASD perceive other people only at the level of objects. The psychologist from the Institute of Health and Medical Research (France) M. Zilbovicius explains: "Because of genetic disorders, the brain of these children is excessively active. He just does not have time to connect, analyze everything that the child sees, hears, feels. The world is perceived in a fragmented and distorted way by him" (These images show how autistics see the world).

According to the data obtained in the course of our own research, children with ASD and mental retardation hardly concentrate on drawings. Such children can perceive people at the level of objects. According to our data, the process is aggravated, by the severity of intellectual disorders. Three out of ten children did not name the man on the balcony of the house (Figure 3), besides, there were difficulties in recognizing the image of Baba Yaga (Russian fairy monster old lady) in the illus-

trations by G. Spirin (В сказочном царстве. Иллюстратор Геннадий Константинович Спирин [In the fairy-tale kingdom. The illustrator Gennadiy Konstantinovich Spirin]).

Figure 3. The illustration for the book "The Day, When the Whale Returned". The author and artist is B. Davis.

Field dependence". This is how Kostin (1997) denoted the difficulty of isolating individual elements in a composite image, as well as the semantic organization of the visual field. Two children with ASD and mental retardation demonstrated the same features.

This quality of visual perception of people with ASD should be taken into account by a designer when creating complex system products - books, workplaces, interiors. You either need to simplify the form, or create a clear, well-perceived structure, avoiding unnecessary detail. Another option is to set the sequence of special simple individual elements that together make up something more complex without losing the integrity of the image.

"Gestalt" perception, i.e. poorly articulated, insufficiently detailed style of perception. Researchers note that "it is difficult to figure out in detail that it consists of a lot of details, saturated with perceptual information and at the same time given without any obvious subject content". As a rule, it was difficult for them to figure out the concept of the drawing" (Kostin, 1997). So, in everyday life, a small change (for example, otherwise arranged furniture in a well-known room) can become a reason for an affective breakdown for a person with ASD. The undifferentiated representation is completely destroyed by the slightest change in details; subjectively, a person with ASD is in a completely new, unfamiliar situation.

Children with ASD and mental retardation saw a "tree" in the picture depicting Baba Yaga, yet, in the other picture, "Thumbelina sitting on a flower", children saw a "butterfly". Thus, even if the drawing is realistic, objects can be perceived as distorted if they are not clearly drawn.

Children with ASD and mental retardation (MR) almost do not pay any attention to background details, especially small ones. So, they spotted flying birds in the foreground, but the image of the lakes in the background were not noted. In another picture, only the central figure of the cat was marked by a child with ASD and MR, and other cats, shown on the right and along the perimeter, went left unnoticed, perhaps they seemed insignificant to the child with ASD and MR, or merged with the background. On the other hand, a rooster and a kitty, depicted along the perimeter of the picture, were carefully described. However, the central figure was left unattended. Noteworthy, that 40% of children managed to exhibit the ability to perceive both the background of images, including a reduced format, and performed the description with less accuracy (children counted houses, specified that there was snow in the street, etc.).

Figure 4. Baba Yaga. Illustration for the children's book. The artist is G. Spirin. http://vladmama.ru/forum/viewtopic.php?f=585&t=202523

This observation is especially significant when a person with ASD contacts dynamic images, including virtual images. Perhaps, the person generally denies them in training or sets very strict limits of their usage.

The difficulty of contact with a changing environment can be partially removed if, say, before the beginning of school classes a child with a ASD receives from a certain source (textbook, manual, book, manual) a visual image of the space in which he is to be. Correct graphic design is able to inform and prevent possible affective reactions.

Inflexibility, inertness of perceptual processes. The method of organizing the visual image, which the person with ASD designated to be the first one, as a rule, is rigidly

imprinted in the consciousness and is hard to be changed. In everyday behavior of people with ASD, this leads to categorical views, a weak ability to take another point of view, the difficulty of changing one's behavior in accordance with the dynamics of the situation.

In the course of the study children with ASD and mental retardation made a lot of errors. For example, they called storks geese, which flew in jamb. They called dogs deer, who were harnessed to a team. The castle looked like Moscow (linked to the image of the Kremlin), they called a dwarf Santa Claus, and a cat – a wolf, a squirrel – a fox, a girl – a grandmother, etc.

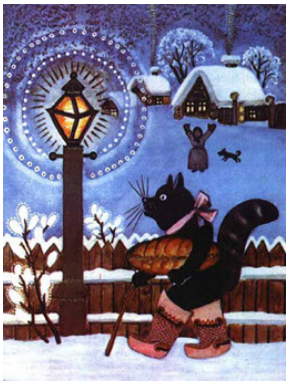

Figure 5. Koten'ka Kotok. Illustration in a children's book. Artist Y. Vasnetsov http://miryanin.narod.ru/vasnecov3.jpg

Undoubtedly, designers are mostly focused on new, original, innovative ideas. In the case of projects for people with ASD they will most likely have to moderate their craving for novelty, opposing it to some conservatism of solutions or introducing novelty in moderate doses. This is possible only if a designer has data about his target audience, conducting preliminary interviews and surveys.

The affectivity of perception – a process with the high dependence of intellectual productivity activity on the emotional state. This means that the visual field can be structured in a special way, led by affective behavior. Separate affect-charged islands ("figures") can be allocated in a more or less equal background. The latter are mostly often associated with the subject of affects, the stereotypical interests of the autistic personality. This attractiveness determines the two-tiered structure of the visual field: it contrasts the affectively charged figure that stands out on an emotionally neutral background.

Children with ASD and MR often showed reluctance to view pictures, if for this it was necessary to distract them from a meaningful task. It was necessary to get them interested in the activity. Perhaps, a picture depicting things that were important to children could cause more interest. All children watched with a bigger interest familiar, affectively relevant pictures, primarily related to an interesting for them activity.

Evidently the children with ASD and mental retardation liked the pictures made in a more realistic style (В сказочном царстве. Иллюстратор Геннадий Константинович Спирин [In the fairy-tale kingdom. The illustrator Gennadiy Konstantinovich Spirin]); children described these pictures better, noticed more details.

In the course of the study it was revealed that children with ASD had a more rapid perception of a number of details of images, in comparison with the average indicators of normal children. The difference is quite evident in case with the number of objects that the child named almost without thinking – 16.

In addition, it was found that some children with ASD can be assisted very closely by tactile contact. The child takes words better, if he is taken by the hand, stroked on the head. The teacher can some-how designate his presence at a tactile level, if the child does not mind it. The polysensory perception provides a better understanding of these activities by the children. This aspect can be taken into account in design of manuals for such children.

In addition, the organization of the visual field must be necessarily based on speech, verbal function (Kostin, 1997). Studies show that in the organization of the visual field, one can move towards a greater activity, integrity, improving, in the final analysis, the general adaptation of people with ASD. At the same time, as we assume, the effectiveness of work with perceptual material can be raised, if from the first years of life the child with ASD will be accompanied by the products of professionally tailored design.

4. CONCLUSION

The obtained data outlines the horizons of further psychological research of the visual perception of the people with ASD. Our findings confirm unusual parameters and criteria for evaluating the designer's work with products for people of this category.

There is a growing need for a holistic system description of the diversity of research in this field. Of much importance is the clarification of leading approaches to the design

of quality didactic materials for children with ASD in inclusive educational space. Much attention should be given to psychological and social mechanisms, structural elements, aesthetics and stylistics of products, as well as their formats and functions.

At one of the initial stages it is necessary to determine the level of intuitive (D. Norman) and attractive images. A study on clarifying the features of understanding and adopting a particular style of visual materials for children with ASD can be continued with the help of special equipment, an eye tracker in particular.

In turn, this activity requires adequate project tools and helps not only develop the theory and practice of graphic design, but above all, makes the process of including children with ASD in the education system more successful.

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Conflict of interests

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GRAMMATICAL PARALLELISM EFFECT IN ANAPHORA RESOLUTION: USING DATA FROM RUSSIAN TO CHOOSE BETWEEN THEORETICAL APPROACHES

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grammatical roles.

ABSTRACT

In the present study we explored structural parallelism, the preference of hearers to connect an unaccented pronoun to a referent occupying the same syntactic position. The traditional linguistic approach is based on the fact that referential preferences are associated with specific linguistic properties of potential antecedents of pronouns. Discourse-coherent approach is based on a hearer`s coherence-driven expectations about discourse continuation and supposes a structural parallelism effect to be a by-product of establishing relations, which provide the coherence of discourse. From this point of view, parallel reading is caused by information structure. In order to investigate the role of grammatical and information structures in the parallelism effect, and to choose between the theoretical approaches, we addressed a flexible word-order language, which has several ways of focusing, such as Russian. The two experiments demonstrated that the use of non-contrastive focusing strategy reveals parallelism bias to be equally strong for both subject-subject and object-object dependencies. We found that syntactic roles' congruence is insufficient for the parallelism effect. Instead, parallel elements are required to occupy the topical position in the information structure of their clauses to provide the parallel reading. This evidence showed that structural parallelism effect is driven by information structure and is a by-product of establishing more general discourse relations, which provide its coherence.

1. INTRODUCTION

Anaphora is one of the crucial factors that provide the coherence of discourse. Pronouns are explicit markers of the relations between the current utterance and the previously established context. The resolution of anaphora depends on a number of factors on different levels of language. While the algorithms of syntactic modules rule out certain antecedents (Reinhart, 2000; Reuland, 2003; Reuland 2011), the co-reference in discourse suggests that the antecedent could be freely chosen. Generally, pronouns tend to refer to the entities that are more accessible at a particular point of the discourse. This accessibility is provided by various factors related to the three components of the discourse structure: linguistic, intentional, and the focus of attention, or attentional structure. Linguistic structure groups units into discourse segments; the intentional structure determines the discourse segment`s purposes and relations between them; finally, the attentional structure subserves the changes of attention within the discourse segments.

There are two approaches to determine mechanisms of anaphora resolution. According to the first, the interpretation of anaphoric

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dependences is guided by bottom-up information processing – from grammatical structure to the discourse. The main argument in favor of this approach is a large amount of experimental data demonstrating that referential preferences of the addressee are formed according to the grammatical characteristics of the referential expression and its antecedent. Thus, one of the main factors that influence reference assignment is the syntactic position of the antecedent. Referents in the subject position are more accessible than referents in the object or any other syntactic position, and consequently the subjects are the best antecedent candidates for pronouns (see Garnham, 2001 for overview). Another approach claims semantics and world knowledge to be central factors that determine reference assignment (Hobbs, 1979). Developing Hobbs` ideas about discourse coherence and the Expectation Hypothesis by J. Arnold (2001) A. Kehler et al. (2008) suggested that interpretative mechanisms of anaphora are based both on the expectations of the addressee about the discourse continuation (top-down mechanisms) and on the analysis of the concrete linguistic data (bottom-up mechanisms).

In order to choose between two theoretical approaches we addressed the phenomenon called structural parallelism, i.e. the preference of hearers to connect an unaccented pronoun in subject position to the previous subject NP (1-a), and an unaccented pronoun in object position to the previous object NP (1-b).

(1) First Mary hugged Jane, and then…
a. …she hugged John. (she = Mary)
b. …John hugged her. (her = Jane)

Parallelism is an interesting topic: there are several experimental studies on English data that demonstrated the parallelism bias to be a very strong perceptual strategy in pronoun resolution for both subject-subject and object-object dependencies (see Chambers and Smyth, 1998; Smyth, 1994; and Stevenson et al., 1995, inter alia). Below, we review the investigations of structural parallelism and provide evidence from two experiments on Russian data which show that the grammatical role parallelism is, in fact, a by-product of establishing more general discourse relations that provide its coherence.

1.1. Structural parallelism

The structural parallelism, or the parallel syntactic function phenomenon, refers to the preference of connecting a pronoun in subject position to an antecedent in subject position and a pronoun in object position to an antecedent in object position (Sheldon, 1974). Thus, in (2) the pronoun ‘he’ in the second sentence preferably refers to ‘Peter’, and the pronoun ‘him’ – to ‘John’.

(2) Peter saw John in the University yard.
He asked him how the examination was. (he = Peter; him = John)

The first experimental studies of structural parallelism found a strong preference for pronouns to refer to the antecedents in the same syntactic position (Grober et al., 1978). However, these studies showed no distinguished preference for parallel syntactic position from subject preference (or subjecthood), since only the subject pronouns were investigated. Later studies demonstrated a parallelism effect for both subject-subject and object-object dependencies (Chambers and Smyth, 1998; Smyth, 1994). Smyth (1994) formulated the parallelism rule in his Extended Feature Match Hypothesis, which predicts an ambiguous pronoun with two or more grammatically and pragmatically possible antecedents to be ‘interpreted as co-referential with the candidate that has the same grammatical role’ (p. 197). At the same time, it turned out that the bias is strong only if the constituents have the same structure and congruent thematic roles. If these conditions don`t hold, the parallelism effect decreases (3).

(3) Kathy tried to catch Joy and Michael bored her. (her = ?)
(Chambers and Smyth, 1998)

Another experimental study reports that if utterances are not structurally congruent, the subject and non-subject pronouns are both likely to be connected to the subject antecedents (Stevenson et al., 1995). As a result, the definition of parallelism was supplemented by a requirement of the congruence of constituents’ structure within parallel utterances.

Notwithstanding the parallelism preference is a very strong bias, it can be easily overridden by pragmatic factors.

(4) John hit Bill, and then Mrs. Smith punished him. (him = John)
(Zuckerman et al., 2002)

The parallel function strategy assumes that in (4) the pronoun ‘him’ should refer to the NP ‘Bill’, i.e. object-object dependency. However, it is obvious that in the described situation the person who was hitting is most likely to be punished; in other words, ‘him’ (pronoun in object position) will refer to ‘John’ (NP in subject position).

Finally, the parallelism affects only unaccented pronouns. When a pronoun receives a phrasal stress, the shift in reference occurs (Akmajian and Jackendoff, 1970). The definition of this referential shift was formulated in the stress rule prescribing that in order to correctly interpret an accented ambiguous pronoun one needs to establish the reference according to the parallelism (under the unstressed reading), and then cancel it and select another available referent as an antecedent for the pronoun (see Baauw et al., 2011; Kameyama, 1999, inter alia). Thus, in (5-a) the preferable antecedent for the accented pronoun 'SHE' will be 'Jane', and in (5-b) the preferable antecedent for pronoun 'HER' will be 'Mary' (stress is marked by capital letters).

(5) First Mary hugged Jane, and then…
a. …SHE hugged John. (SHE = Jane)
b. …John hugged HER. (HER = Mary)

Summarizing, the traditional linguistic view on parallelism is based on the fact that referential preferences are associated with specific linguistic properties of potential antecedents of pronouns. From this perspective the interpretation of pronouns in sentences with structural parallelism involves several operations. The first step is the recognition of parallel structures, checking their congruence and the interpretation of lexical semantics and pragmatics of predicates. If there are no pragmatic preferences (such as in (4) above), the parallel interpretation construal can be constructed, i.e. pronoun is to be identified with an NP in the same syntactic position (step 2). In the case of the accentuation of a pronoun, step 3 is added, called referential shift, where the antecedent selected by parallelism is rejected and an alternative candidate is chosen (Avrutin et al., 1999; Baauw et al., 2011). Note that the stress rule does not determine the preferable antecedent for a pronoun; it only gives a signal that the referent selected by parallelism must be rejected. If there are only two potential antecedents, like in (5), the preferable candidate will be chosen automatically. If there are several candidates, like in (6), the stress only rules out the NP 'Bill' but leaves the pronoun ambiguous between 'John' and 'Peter'.

(6) John introduced Bill to Peter, and then Mary introduced HIM to Frank. (him ≠ Bill; him = ?)

(Baauw et al., 2011)

1.2. Coherence-driven approach to parallelism

Kehler et al. (2008) proposed another approach to pronoun interpretation. Developing the idea by Hobbs (1979), they claim that the identification of a correct referent for the pronoun is a by-product of establishing more general discourse relations (Explanation, Parallel, Result, etc.) to provide the coherence of the discourse. In the context of the structural parallelism, Kehler (2002, 2005) argues that this effect is affiliated with Resemblance coherence relations, such as Parallel, which 'are established by identifying a 'common topic' for a set of utterances' (Kehler, 2005, p. 108). This 'common topic' represents a kind of background, i.e. some given information, which is opposed to the focal entities, i.e. the new information. An entity can be counted as a part of the background only if it is co-referent with its parallel element. Therefore, parallelism is driven by information structure, and in fact, is a by-product of information structure establishing. In (1-a), repeated in (7-a) 'Mary' becomes part of the background (e.g. Whom has Mary hugged), and 'John' is a focal element, opposite to 'Jane' in this Parallel relation. Similarly, 'Jane' is a part of the background in (1-b), repeated in (7-b), and 'John' is focal element, opposed this time to 'Mary' (e.d. Who has hugged Jane).

(7) {First Mary hugged Jane, and then}
a. she hugged $JOHN_F$. (she = Mary)
b. $JOHN_F$ hugged her. (her = Jane)

Kehler`s model is based on the hearer`s coherence-driven expectations about the discourse continuation and correlates with Arnold`s Expectancy Hypothesis, which supposed the referents accessibility to be based on the hearer`s probabilistic expectations about which of the referents will be mentioned next in the discourse (Arnold, 2001). It stands to reason that Parallel relations are expected by hearers. Corpus studies, which obviously reflect speech production process, demonstrated that similar structures tend to appear near each other with a probability above chance level. The robust effect of parallelism was shown for a variety of NP types. It occurs in different contexts, i.e. between NPs in the same sentence and NPs in two adjacent sentences (Dubey et al., 2008). This probability underlies the hearer`s expectations about how the discourse is likely to be continued.

As is seen from above, the Parallel reading is provided by information structure. Speakers use basic tools of focusing, such as

intonation, for example, to manage hearer`s expectations during the discourse comprehension. In cases of typical Resemblance relations (Parallel), the given entities form the background that is introduced in topical unstressed position, while the new entities, which are introduced in contrast to each other (like 'John' and 'Mary' in the example (7-a) above), must be focused (in English, by accentuation of the focal entity). However, in some cases the given NP and the given verb form a contextual new VP. This new VP represents new information, which doesn`t correlate with the hearer`s expectations, and consequently, for the purpose of attracting hearer`s attention to this new information, the corresponding entity must be focused by any available tool, including the contrastive stress. Thus, in (5), repeated in (8), pronouns should be focused to provide the Parallel reading, where 'Mary' and 'Jane' do the same act to someone in (8-a), and where somebody does the same act to both 'Mary' and 'Jane' in (8-b).

(8) {First Mary hugged Jane, and then}
a. SHE_F hugged $JOHN_F$. (SHE = Jane)
b. $JOHN_F$ hugged HER_F. (HER = Mary)

Significantly, the stress pattern in this case is independent of the referential choice, i.e. of the choice to pronominalize the subject in (8-a) and the object in (8-b) or to use the full NPs, and it concerns the co-reference in general rather than pronominalization.

In relation to the structures such as (4) above, repeated in (9), the described co-referential principles don`t apply, since such sentences represent another type of coherence relation – the Cause-Effect relations (e.g. Result), not Resemblance (e.g. Parallel). With this reading, the coordinate conjunction 'and then' can be paraphrased as 'and as a result', whereas the conjunction in Parallel construal means 'and similarly'. The Result construal is based not on the similarity and contrast, but instead on the world knowledge about what effect can be caused by some act; and the information structure is defined in accordance with this knowledge (see Kehler, 2005 for details).

(9) John hit Bill, and then Mrs. Smith punished him. (him = John)

Taking all things together, the main idea of a coherence-driven approach to the pronoun resolution is that the parallelism effect represents an epiphenomenon of establishing the Resemblance relations, which are one of the means to provide the coherence of discourse.

In order to investigate the role of information structure in the parallelism effect, we addressed a flexible word-order language, which has several ways of focusing (e.g. by word-order permutation or by accentuation), such as Russian.

1.3. The information structure in Russian

Russian is a flexible word-order language, i.e. it permits changing the order of sentence constituents without any change in grammatical relations between them. Different word orders reflect the information structure encoding, dividing the sentence into given (topic) and new (focus) information. The way of establishing the information structural roles (topic and focus) depends on the two types of parameters: syntactic, i.e. default word-order and its variability; and prosodic, i.e. the default position of main phrasal stress and its capacity to be shifted (Cinque, 1993). The canonical word-order (that is appropriate for zero context) in Russian is SVO (subject-verb-object), with a high degree of flexibility. The main phrasal stress is located on the rightmost constituent (final stress prominence) by default, but can be easily moved in a relevant context. Therefore, two strategies of focusing are available in Russian: (i) by shifting the phrasal stress, i.e. by accentuation of the entity that should be focused (10-a); (ii) by permutation of the canonical word-order (SVO), so that the focal entity occupies the rightmost position, i.e. position of the main phrasal stress (10-b). The first strategy is mostly used for contrastive focusing, the second one – for non-contrastive focusing.

(10) Kto ispek pirog?
Who-Nom baked the pie-Acc?
a. [Moya MAMA]$_F$ ispekla pirog.
[My MOTHER-Nom]$_F$ baked the pie-Acc.
b. Pirog ispekla [moya MAMA]$_F$.
The pie-Acc baked [my MOTHER-Nom]$_F$

By comparison, in fixed word-order languages, such as English, only the first strategy is available (11), and the stress is considered as a main tool of information structure establishing.

(11) Who baked the pie?
[My MOTHER]$_F$ baked the pie.

We investigated the parallelism effect in Russian: the influence of the information structure on the pronominal reference and the role of word-order in pronoun resolution. Experiment 1 deals with the parallelism effect in the fully congruent adjacent clauses, with canonical SVO word-order and un-stressed pronouns in either subject or object position

in the second clause. We also evaluated the role of contrastive stress in referential shift (in parallelism violation). Experiment 2 examines the role of word-order permutations in pronoun resolution, particularly, predicting that the parallelism effect decreases when the two clauses are not fully congruent.

2. EXPERIMENT 1

2.1. Materials and methods

The first experiment addresses the parallelism effect in Russian and the influence of the stress on referential shift.

In a 2 x 2 design, stimulus sets were constructed with four variants (12a–d), each composed of two clauses. The first clause was an introduction of two possible referents of the same gender, the second clause contained an ambiguous pronoun. Both clauses contained the same transitive verb in the active voice. Only the canonical SVO word-order was used.

(12) Snačala ženšin-a pošekotala devočk-u, a potom…

First the woman-Nom tickled the girl-Acc, and then…

a. … ona pošekotala malčik-a. [Parallelism; Unstressed Subject Pronoun]

…she-Nom tickled the boy-Acc.

b. … malčik pošekotal ee. [Parallelism; Unstressed Object Pronoun]

… the boy-Nom tickled her-Acc.

c. … ONA pošekotala malčik-a. [Stress; Stressed Subject Pronoun]

… SHE tickled the boy-Acc.

d. … malčik pošekotal EE. [Stress; Stressed Object Pronoun]

… the boy tickled HER-Acc.

Thirteen stimulus sets were constructed for a total of fifty-two experimental stimuli. Each set varied pronoun position (subject/object) and pronoun accent (un-stressed pronoun/stressed pronoun). In addition to the stimuli items, fifty-two filler passages of the same length were created. All the fillers were unambiguous sentences. Thirteen of them contained reflexives, twenty-six contained unambiguous third-person singular pronouns, and thirteen fillers contained unambiguous third-person plural pronouns.

As we aimed to investigate the effect of structural parallelism on ambiguous pronoun resolution, we needed to avoid the influence of world knowledge on the reference. To create the contexts in which either referent was a plausible antecedent for the pronoun, we introduced four characters which were mentioned in the materials (in both, stimuli and fillers). Those were *'the man', 'the woman', 'the boy', and 'the girl'*. Our participants were instructed that all the stories describe a kind of a game between these characters, who perform different acts.

Picture selection task was chosen as a method. For each experimental item a set of four pictures was presented on two pages of A4 size paper. One picture on the left page depicted the first clause, and three pictures were on the right page. Two of them belonged to the second part of the sentence, representing two possible interpretations of ambiguous pronouns (with two possible referents). The third picture on the right page was a filler distracter, on which the same referents perform another action.

All the 104 items were presented orally at random and repeated as often as necessary. The participants were asked to listen to the sentences, while looking at the pictures, and then to point at the picture that corresponds to the sentence. Each participant was tested separately in a quiet room. The entire experimental procedure lasted approximately 30 min.

Twenty-six healthy adults, naïve to linguistic theory, participated in the experiment on voluntary basis. All were self-reported monolingual native speakers of Russian. Participants were informed about the experiment procedure, the possibility of quitting experiment at any time, and about the fact that all the collected data would remain anonymous. After that they signed a written informed consent.

2.2. Results

The 2 x 2 analyses of variance (ANOVA) with the factors pronoun position (subject/object) and pronoun accentuation (unstressed/stressed) were performed for subjects (F1) and items (F2). The dependent measure was the proportion of judgments indicating referents in accordance with the parallelism. By this criterion, the significant difference between stressed and unstressed conditions demonstrates the presence of stress rule, i.e. the influence of a pronoun accentuation on shift in reference. Mean proportion of responses given in favor of parallelism in all four conditions is shown in Table 1.

We got an important effect of the stress on pronoun resolution ($F1(1,25) = 88.355$, $p < 0.001$; $F2(1,12) = 186.520$, $p < 0.001$). There was also an effect of pronoun syntactic posi-

tion ($F1(1,25) = 48.204$, $p = 0.001$; $F2(1,12) = 96.429$, $p < 0.001$).

Table 1. Mean proportion of responses identifying the referent in similar syntactic position as the antecedent of pronoun (according to parallelism rule)

Pronoun syntactic position	Pronoun accentuation	
	Unstressed	Stressed
Subject	0.970	0.651
Object	0.775	0.269

The comparisons revealed a greater effect of parallelism for subject-subject dependencies than for object-object dependencies – 97 % vs 78 %. The significant interaction between pronoun position and pronoun accentuation was shown ($F1(1,25) = 8.667$, $p = 0.007$; $F2(1,12) = 25.497$, $p < 0.001$). The rules – parallelism and stress rule – have not shown the equally strong effect for both subject and object pronouns. Thus, the effect of stress turned out to be significantly smaller than the parallelism effect in the sentences with subject pronouns ($F1(1,25) = 109.680$, $p < 0.001$; $F2(1,12) = 288.235$, $p < 0.001$), whereas no reliable difference was found between the effects in the sentences with object pronouns ($F`s < 1$). The overall accuracy of the responses on the filler items containing unambiguous pronouns was 100 %.

2.3. Discussion

Experiment 1 demonstrated that parallelism of syntactic position affects ambiguous pronoun resolution in Russian. A strong bias towards interpreting the unstressed subject pronoun to refer to the NP in subject position, and the unstressed object pronoun to refer to the NP in object position was found. However, the effect degree is significantly different between subject-subject and object-object dependencies: while subject pronouns (12-a) were across-the-board connected to antecedents in subject position (97 %), object pronouns (12-b) referred to their parallel entities only in 78 % of cases. The main effect of the contrastive stress was demonstrated; however, the results for subject and object pronouns seem to be contradictory. We found that the robust stress effect in object-object dependencies (12-d) resulted from referring the stressed object pronouns to the subject NPs. At the same time, this effect dramatically decreases in sentences with stressed subject pronouns (12-c), where only 35 % of responses followed the stress rule. It is obvious that the stress is not completely ignored (such being the case we would have no intended responses) but for some reason our participants tended to interpret the stressed subject pronouns by analogy with unstressed ones. Combining these results with scores on un-stressed object pronouns (12-b), which in 22 % of responses were connected to the subject NPs, we get evidence in support of Centering and some other theories that consider subjects to be preferable antecedent candidates for ambiguous pronouns (Ariel, 2001; Grosz et al., 1995). Moreover, the subject preference (subjecthood) is considered as a default strategy in pronoun resolution (Zuckerman et al., 2002-a, inter alia). Following this approach in relation to our data we may expect higher scores on all conditions where subject NPs are intended to be pronoun antecedents over the conditions where object NPs are intended antecedents. In fact, Experiment 1 demonstrated the strongest effect of parallelism in (12-a) in comparison with (12-b) and the strongest effect of contrastive stress in (12-d) in comparison with (12-c). However, the overage of the intended responses in (12-a) over (12-b), which both supposed subjects to be pronoun antecedents (97 % vs 73 %, see Table 1), remains unexplained. Another unanswered question is why the parallelism effect turned to be stronger than the stress effect.

We propose an interpretation for these results based on coherence-driven approach. Let us assume that the parallelism and the stress rule are by-products of the information structure establishing. As was stated above, the two strategies of focusing are available in Russian – by moving the focal entity to the rightmost position, which receives the phrasal stress by default, or by shifting the phrasal stress on the word that should be focused. The former strategy is typical for non-contrastive focusing; the latter is used mainly for contrastive focusing in an appropriate context. As only sentences with canonical SVO word-order were included in the experiment, we had to use both strategies. Thus, in the parallel sentences with subject pronoun the focal word occupies the final position in the clause and receives the main phrasal stress (12-a), whereas in parallel sentences with object pronoun the main phrasal stress is shifted to the word that should be emphasized (12-b). The same is relevant for stressed conditions, where the main focusing strategy is applied in sentences with

object pronouns (12-d), while the contrastive focusing is used in sentences with subject pronouns (12-c). If pronoun interpretation is associated with information structure constraints, then it must be sensitive to the choice of focusing strategy. The application of contrastive focusing in zero contexts may cause the decrease of the main effects (e.g. parallelism). Generally, it is reflected in the fact that the main effects are stronger in conditions with default focusing strategy – (12-a) and (12-d), then in conditions (12-b) and (12-c), where the contrastive focusing is used. Thus, we got significantly fewer of intended answers in (12-c) in contrast to (12-d) than in (12-b) in contrast to (12-a), see Table 1.

However, the reduction ration is not the same in both condition pairs: the stress effect decreases more than parallel effect. We suppose that these results were caused by the interaction of the focus establishing and the choice of anaphoric expression, which took place in (12-c). In Russian, typical markers of contrastive focus are demonstrative pronouns, such as 'tot' (that-Masc.) and 'ta' (that-Fem.). The use of personal pronouns in the position of contrastive beginning is possible but not desirable. In accordance with the model proposed by Rohde and Kehler (2014), the interpretation of pronouns depends on a hearer`s expectation of which referent will be subsequently mentioned in the discourse and her expectation that a personal pronoun will be used as an anaphoric expression. Expectations about next-mentioned referents are provided by semantics, world knowledge and information structure assignment. The influence of the first two components was counter-balanced in our experiment. As to the information structure, the choice of contrastive focusing strategy without appropriate context misleads the hearer`s expectation. On the other hand, the probability that the pronoun in focus will refer to the intended NP (to 'devočka' (the girl) in (12-c) is low, as the demonstrative 'ta' (that) is more expected in this role (the hypothesis that the use of pronouns and demonstratives is dichotomous for parallel and unparallel reading will be tested in Experiment 2). Taking together the undetermined next-mention expectations and low-level probability of personal pronoun use, we receive low preference for connection of the subject pronoun with the object NP in (12-c).

We argue that the use of non-contrastive focusing strategy and the adequate choice of anaphoric expressions will reveal equal parallelism bias for both subject-subject and object-object dependencies. We also claim that parallel elements should be identified as topics in their clauses, otherwise the parallelism effect is reduced. These predictions are examined in Experiment 2.

3. EXPERIMENT 2

3.1. Materials and methods

In the second experiment we investigated the role of information structure in the parallelism bias, which provides the division on topic and focus, given and new information. As was stated above, the parallelism bias could be successfully applied only if the common background (common topic) for both clauses can be identified. We examined the interpretation of pronouns in sentences with parallelism of syntactic position during the silent reading, when the division on topic and focus (i.e. given and new information) is provided only by word-order and silent prosody. In reference to J. D. Fodor (2002), we supposed that the default prosodic contour, with the main phrasal stress on the last word of the clause, is projected onto the stimuli. From this perspective the referent mentioned first in sentences with parallelism (12) is considered as the topic of the preamble clause, and the referent mentioned second – as the focus. The same division is relevant for target clauses with a pronoun.

We found a robust parallelism effect for subject-subject dependencies in Experiment 1, so that the goal of Experiment 2 was to test whether personal pronouns and demonstratives in subject position are dichotomous for parallel and unparallel reading. We also examined the influence of the referent`s position in information structure on subject-pronoun resolution. Since Experiment 1 demonstrated the lower parallelism effect for object-object dependencies than for subject-subject dependencies, the question arises what these results are caused by. Two possible explanations have been already discussed above. The first one is based on the linguistic properties of referents and claims that subject are always most preferable antecedent candidates for pronouns than non-subjects. Although parallelism seems to be a robust bias, the influence of subjec-thood affects it, making the effect stronger for subject pronouns and weaker for object pronouns. The second explanation addressees the means of focusing used in experimental sentences and assumes that the use of contrastive focusing strategy (i.e. focusing by shifting the

phrasal stress) in parallel structures with object pronouns (12-b) causes the reduction ratio of answers in accordance with parallelism. We suppose that parallelism bias would be equally strong for both subject-subject and object-object dependencies if the same focusing strategy is applied. In Experiment 2 we manipulated the word-order in both parts of the stimuli sentences with object-pronouns to test this statement.

The materials were based on the stimuli of Experiment 1. Two stimulus sets were constructed. The first set (13) contained a pronoun in subject-position and varied the type of pronoun (personal/demonstrative) and the word-order in the preamble clause (SVO/OVS). The second set (14) contained a pronoun in object position and varied word-order in the preamble clause, i.e. referents` position (SVO/OVS), and the word-order in the target clause, i.e. pronoun position (SVO/OVS).

(13) a. Snačala ženšin-a pošekotala devočk-u, a potom ona pošekotala malčik-a. (SVO-SVO)

First the woman-Nom tickled the girl-Acc, and then she-Nom tickled the boy-Acc.

b. Snačala ženšin-a pošekotala devočk-u, a potom ta pošekotala malčik-a. (SVO-SVO, Dem.)

First the woman-Nom tickled the girl-Acc, and then that-Nom,Fem tickled the boy-Acc.

c. Snačala devočk-u pošekotala ženšin-a, a potom ona pošekotala malčik-a. (OVS-SVO)

First the girl-Acc tickled the woman-Nom, and then she-Nom tickled the boy-Acc.

(14) a. Snačala ženšin-a pošekotala devočk-u, a potom malčik pošekotal ee. (SVO-SVO)

First the woman-Nom tickled the girl-Acc, and then the boy-Nom tickled her-Acc.

b. Snačala ženšin-a pošekotala devočk-u, a potom ee malčik pošekotal. (SVO-OVS)

First the woman-Nom tickled the girl-Acc, and then her-Acc tickled the boy-Nom.

c. Snačala devočk-u pošekotala ženšin-a, a potom malčik pošekotal ee. (OVS-SVO)

First the girl-Acc tickled the wom-an-Nom, and then the boy-Nom tickled her-Acc.

d. Snačala devočk-u pošekotala ženšin-a, a potom ee pošekotal malčik. (OVS-OVS)

First the girl-Acc tickled the woman-Nom, and then her-Acc tickled the boy-Nom.

Total material contained 91 stimuli items, which were combined with fillers from Experiment 1.

Participants were given a questionnaire, for which they read experimental sentences and answered a question immediately after, as in (15).

(15) Snačala ženšin-a pošekotala devočk-u, a potom ona pošekotala malčik-a.

Kto pošekotal malčik-a?

First the woman-Nom tickled the girl-Acc, and then she-Nom tickled the boy-Acc.

Who tickled the boy?

The answers supposed to indicate the antecedent chosen by participants while interpreting the ambiguous pronoun.

Thirty healthy adults, naïve to linguistic theory, participated in the experiment. All were self-reported monolingual native speakers of Russian. No one in this group had participated in Experiment 1.

3.2. Results

We analyzed the interpretations of subject (13) and object (14) pronouns separately. The results for subject pronouns are presented in Table 2. The dependent measure for statistical analysis was the rate of assignments to subject antecedent.

Table 2. Mean proportion of responses identifying the referent in subject position as the antecedent of subject pronoun

Word-order in conjoint clauses	Pronoun type	
	Personal	Demonstrative
SVO-SVO	0.895	0.097
OVS-SVO	0.677	xxx

Greater effect of the anaphor type was found ($F1(1,29) = 229.741$, $p < 0.001$; $F2(1,12) = 902.529$, $p < 0.001$). Personal pronouns were connected with subject referents in 89.5 % of responses, while this rate for demonstratives was only about 9.7 %. Our participants tended to refer the demonstratives to antecedents in object position. It was also shown that the referent position factor influenced pronoun resolution ($F1(1,29) = 25.474$, $p < 0.001$; $F2(1,12) = 50.058$, $p < 0.001$).

The results for object pronouns interpretation are presented in Table 3.

Table 3. Mean proportion of responses identifying the referent in object position as the antecedent of object pronoun

Object referent position	Object pronoun position	
	OVS	SVO
OVS	0.852	0.667
SVO	0.814	0.528

A mixed factorial analysis with repeated measures (RM ANOVA) was conducted with object referent position in information structure (Topic/Focus) and object pronoun position (Topic/Focus) as factors. The dependent measure was the rate of assignments to object antecedents. The analysis confirmed that both the referent position ($F1(1,29) = 9.143$, $p = 0.005$; $F2(1,12) = 19.561$, $p = 0.001$) and the pronoun position ($F1(1,29) = 29.541$, $p < 0.001$; $F2(1,12) = 138.217$, $p < 0.001$) influence the parallel reading. However these two factors did not enter into any significant interaction ($F1(1,29) = 2.459$, $p = 0.128$; $F2(1,12) = 5.929$, $p = 0.031$). The comparison of the results for subject-subject and object-object dependencies in sentences with parallel elements at the beginning, i.e. (13-a) and (14-d), did not reveal any significance ($F < 1$). The parallelism effect in these two conditions was equally strong. A binominal test demonstrates that the rate of object antecedent assignment for object pronoun in the condition with canonical SVO word-order in both clauses, such as (14-a), is not significantly different from chance ($p = 0.290$).

3.3. Discussion

The results of Experiment 2 demonstrated that the parallelism bias equally holds for subject-subject and object-object dependencies. No evidence in favor of subject preference was found. However, the grammatical roles' congruence is insufficient for the parallelism effect. We got good results for (14-d) and chance level answers for (14-a) although grammatical and thematic roles of constituents are identical in these sentences. We propose an analysis based on a coherence-driven approach to the parallelism bias. As was said at the beginning of this paper, pronouns are explicit markers of discourse coherence. In other words, the use of a pronoun gives a signal to the hearer that the current utterance is related to the previous context and that some kind of coherence relation (e.g. Parallel, Result, Occasion, etc.) is established by the speaker and must be identified by the hearer or reader. The syntactic similarity of adjacent utterances does not guarantee the parallel reading per se. Different types of coherence relations may have the same grammatical structure (see Kehler et al., 2008 for discussion). To establish a particular type of relation, e.g. parallel, a speaker must compose an appropriate information structure, realizing background vs focus partition in a particular way. In the process of oral communication two instruments are available in Russian to provide this information structural partition – the word-order permutations and stress. In written communication only word-order remains. In the absence of a wide context (such as in our experimental conditions) the word-order might be insufficient for unambiguous information structural partition. Experiment 2 showed that the most favorable condition for parallel relation is created when entities, which form a background, occupy the first position in their clauses, the typical position for topic elements. Thus, readers don`t have difficulty in identifying parallel elements in (13-a) and (14-d), and successfully corefer pronouns to their parallel referents. With regard to (13-b), the lexical marker 'ta' (*'that-Fem'*), being stressed by default, definitely determines the contrastive reading (e.g. '*who did what to whom'*) which was shown in 90 % of responses. In other conditions the personal pronoun (14-c), or its parallel element (13-c, 14-b), or both (14-a) occupied the final position in the clause, which is the default position of the phrasal stress, i.e. these elements are focused. No common background can be formed in these cases, and consequently, no parallel relations are established here.

The high scores for (14-b), repeated in (16) – 81 % of responses in accordance to the parallelism – seem to be an exception, which deserves a fuller explanation.

(16) Snačala ženšin-a pošekotala devočk-u, a potom ee malčik pošekotal. (SVO-OVS)

First the woman-Nom tickled the girl-Acc, and then her-Acc tickled the boy-Nom

We suppose that a different word-order in adjacent clauses interferes with establishing a parallel relation. Another kind of relations available for (16) is the occasion relation, which supposes 'a connect sequence of events that center around a common system of entities' (Kehler, 2005, p. 110). This means that some event (*'the boy tickled somebody'*) happened after another event ('*the woman tickled the girl'*). The object of the second action is

mentioned by personal pronoun and occupies the position of topic (at the beginning of the clause). According to the linear thematic progression, the focus of the previous clause is expected to become the topic of the next one (Danes, 1974). As such, the pronoun refers to the focal element of the first clause, that is, to the object referent *'devočk-u' ('the girl').* Thus, the coincidence of the syntactic roles of the pronoun and its antecedent is a by-product effect in this case.

4. CONCLUSIONS

In the present study we explored anaphora resolution in Russian and structural parallelism. The traditional linguistic view on parallelism is based on the fact that referential preferences are associated with specific linguistic properties of potential antecedents of pronouns. Pronoun accentuation plays a significant role in this approach. Thus, if an ambiguous pronoun receives a stress, then the parallelism is expected to be violated and the shift in reference takes place. On the other side, discourse-coherent approach supposes a structural parallelism effect to be a by-product of establishing the Resemblance relation, which is one of the means to provide the coherence of discourse. This approach is based on a hearer`s coherence-driven expectations about discourse continuation and supposes referent accessibility to be based on probability of referents mentioned next in the discourse. From this point of view, parallel reading is caused by information structure. In order to investigate the role of the information structure in the parallelism effect, and to choose between the two approaches, we conducted two experiments on Russian. Being flexible word-order language with a rich morphology, Russian gives us an opportunity to investigate separately the influence of different factors on reference assignment and complete analysis made on the basis of English data (Prokopenya et al., 2014; Prokopenya, 2014).

Experiment 1 examined the parallelism effect in Russian and evaluated the role of contrastive stress in a referential shift. The results showed that parallelism generally holds for both subject-subject and object-object dependencies. The effect of contrastive stress was significantly smaller. The results varied between the conditions. The explanation based on linguistic properties of the referents supposes that an additional factor, such as subject preference, interferes with the parallelism bias. However, this approach fails explain the evidence from Russian, e.g. why the stress effect was significantly smaller than that of parallelism. In reference to the coherence-driven approach, stress is not an independent factor that influences reference assignment, but it is considered as one of the means participating in information structure establishing, i.e. in topic/focus partition and with word-order permutations. Furthermore, if a pronoun interpretation is associated with information structure constraints, then it must be sensitive to the choice of a focusing strategy. The use of it (focusing by stress shifting) without an appropriate context misleads a hearer`s expectation about the discourse continuation and prevents parallelism bias from being applied. Experiment 2 demonstrated that the use of non-contrastive focusing strategy reveals parallelism bias to be equally strong for both subject-subject and object-object dependencies. Moreover, we found that syntactic roles' congruence is insufficient for the parallelism effect. Instead, parallel elements are required to occupy the topical position in the information structure of their clauses to provide the parallel reading.

Summarizing, the evidence from a flexible word-order language, such as Russian, shows that structural parallelism effect is driven by information structure and, in fact, is an epiphenomenon of establishing more general discourse relations, which provide its coherence.

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Conflict of interests

Authors declare no conflict of interest.

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THE METHODOLOGY OF THE ANALYSIS OF CASE STUDY THROUGH THE INTEGRATION OF THE ROMA MINORITY INTO THE SOCIAL SYSTEM

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ABSTRACT

The Roma are an ethnic group that is spread throughout the world. Although there are poor ethnographic and historical notes about the origin of Roma on the basis of a study of legends and oral traditions, researchers who are engaged in Roma studies, often confirm that they originate from India. Their culture, habits, customs were mostly transmitted through the living word, from generation to generation. This research analyzed case studies of integration of the Roma minority in the social system. Special emphasis in research is aimed at analyzing stereotypes that arise from cultural patterns of Roma, given the fact that for them there are many different prejudices, while on the other hand, there is no access with critical analysis and does not indicate their specialty, which has its downside exactly in culture and patterns of behavior. The study analyzed how the traditional culture is important in the lives of Roma and how the social system treats this ethnic minority. Being a Rom in its original sense means to be human and to be equal with everyone, but paradoxically it is expected that non-Roma nation sets free of stereotypes and prejudices and to contribute to the integration and acceptance of Roma in our social system.

1. INTRODUCTION

If Roma have their own cultural patterns that are in many ways different from the cultural patterns of the majority of the population with whom they live, whether that necessarily implies that we must marginalize? The study presents a case study conceived through the analysis of the Roma minority and their integration into social, social, cultural and educational context of the area where they live. The first part of the research deals with the origin of Roma, while the second and third chapters focus on the social integration of Roma in the social and educational system. Social deprivation Roma is not characteristic only for Serbia but also for other countries in the world, and every form of discrimination involves concerns. Often referred as two key reasons of social deprivation Roma are: low education levels and low levels of expertise. And when we talk about discrimination and integration of Roma, it is necessary to bear in mind that they are most often exposed to negative discrimination. In addition to the objective picture of the living conditions according to which Roma are highly deprived social group (unbearably poor housing conditions, high unemployment of working-age population, insufficient involvement of children in the education system, poor communication with the majority population, poor hygiene and health situation), an important part of the complete picture about their life represents a subjective image of people.

The question is how much the situation has now changed from the generalization of stereotypes that are still present. The paper analyzes certain surveys which examined social distance towards members of the Roma. Roma Integration Strategies should experience a much higher recognition than the one on paper that confirms the legitimate and equal rights of ethnic minorities with the rest of the world (Đurić, 1987; Jakšić, 2002: 335-355; Mirga, Georgi, 2004 11-49).

The method of theoretical analysis shows the characteristics of the origin, cus-

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toms, and culture of Roma, and then examines several documents to affirm the rights of Roma nationality, as well as the results of surveys on the status of the Roma nationality. All the research, but also practice suggests that the success of the two contact groups depends on them working together, finding similarities, as well as finding and accepting cultural forms from other groups.

2. CASE STUDY - CULTURAL ROMA PATTERN

Roma are assigned different names (Gypsy, Gitanos). Members of this nation refer to each other as Roma, which in essence means to be human, while one of the premise is that Roma are named after Rama, hero of the Indian epic Ramayana, the second assumption is about the legend that the Roma arrived in Europe as Roma children i.e. Chavo Roma (Đurić, 1987). There is no systematized written historical sources on the origin of the Roma and their history, but is based on oral tradition, transgenerational transmission, and informed that the Roma originate from India. This is supported by the Roma language in which there are preserved traces of their Indian origin. During all their migrations Roma were exposed to assimilation, which is partly the result of attempts by the authorities in the countries inhabited by Rome to keep them in one place, and partly the result of their fear of persecution and discrimination, and the Roma themselves denied their ethnicity. This process of assimilation of Roma lasts up to the present day. This is the reason why Roma today do not have very clear and unique national and cultural characteristics. For example, although they have their own language, Roma in different countries speak different dialects or language which is a mixture of the Romani language and the environment in which they live. Also, customs, religion and other elements of Roma culture is different in Roma who live in different regions. For centuries, Roma people kept their own cultural identity from disappearing with so-called proper nurturing of Roma holidays (Vlasuljica, St. George, Bibi). Vasilica and St. George ("Erdelez") are above religious, multi-day, unique holidays of all Roma people. Marriage traditions have always been the wealthiest ceremonies in Roma life cycle, followed by several days of gathering of relatives, friends and acquaintances. By implementing even weekly, established actions pictured the position of women and men, the economic power of the family, complex family relationships and others. Establishment of marriage is followed by a series of magical rites of happiness, prosperity, harmony and maximizing offspring between spouses. Communication on Romani language is kept within the family and possibly with neighbors and friends. Older age groups, families with many children and residents of the city are the greatest experts in native language. In the battle against forgetting their origins the most important step is the respect of the Romani language among the Roma (Čvorović, 2006: 47-59; Vantić-Tanjić, 2008; Saitović, 2014).

Roma are almost always immersed in another culture, they are characterized by constant adjustment, assimilation, but also important differences in religion and language. Native language is a distinctive sign of the national identity. But until today, the Roma have preserved a lot of cultural elements that certainly testify to their ethnic identity, including language and beliefs, customs, habits, norms, laws, and many other properties.

3. CASE STUDY - SOCIAL INTEGRATION OF ROMA INTO THE SOCIAL SYSTEM

On the whole, the number and proportion of Roma in the total population of Serbia shows significant variations caused by demographic factors, but also the constant changes in the declaration of ethnicity, which is characteristic of this ethnic community. The reasons should be sought through the process of assimilation or ethnic mimicry Roma due to discrimination, segregation, marginalization and many other reasons (Horvat, 2008: 443-472).

The demographic development of the Roma is characterized by negative tendencies, especially when it comes to the educational structure, employment, housing and health care. Nationality, as the most important ethnic determinant, was incorporated into the content of all population censuses after the Second World War. We must bear in mind that every census represented a mirror of current social and political situation. In the early 1990s, Roma political movements and non-governmental organizations are becoming more active in addressing the problems of Roma (Raduški, 2013; Raduški, 2009: 189-202; Raduški 2004: 433-445).

When we talk about social inclusion of Roma we should rely on ethnicity because

the opposite can cause misunderstandings, disagreements and suspicion. Roma distrust towards some suggestions, ideas, projects and attitudes is conditioned by the historical experiences with many dirty tricks, manipulations and abuses. On the other hand, it is not easy to determine the meaning of the concept of social inclusion, although it is widely present in everyday speech, communication and literature. The question is: How to ensure social inclusion of Roma in the local and wider community and at the same time preserve their cultural, linguistic, and other conventional characteristics, which are not only part of their tradition, self-identification but also the persistence as specific national minority. There is no widely accepted nor the consistent definition of the concept of social inclusion, although the term is often used when it comes to the marginalized, minority and socially risky and deprived social groups. Most of the studies, texts or debates on social exclusion was built on the philosophical and theoretical, legal and exploratory foundations of concepts of universal human rights, and in the literature is mainly in negative context, and concepts such as social exclusion, marginalization, discrimination, rather than it's presented in positive manner (Đorđević, Filipović 2004: 201-204; Jakšić, 2002: 335- 355; Jugović, 2007).

Social exclusion means such position of individuals or small or large social groups that are thwarted in their educational and cultural elevation. Spiritual values and civilization achievements are unavailable to them. They are excluded from the common ordinary, religious, and cultural life activities of narrower or wider community. Therefore, they are forced to cultivate specific lifestyle, customs, habits, forms of communication and behavior or living within the framework of sub-cultural system, often in conflict with the dominating culture and value system. From the psychological aspect the social inclusion means such social conditions in which people can develop and express as free self aware personalities that come together and communicate with other people freely and of their own choice, developing all their physical, mental and creative potentials without jeopardizing others. From the psychological point of view, too, social inclusion contains a special feeling of connection and belonging to certain social groups, communities and global society, love for other people, for people of their own kind, and people in general (Vasović, 1997). The question is whether one can talk about a special Roma culture or subculture. Bearing in mind the traditions, their customs, language, music, games, a common history and destiny could be concluded that there is a specific Roma culture. On the other hand, if we take into account the historically known fact of often mass migrations of Roma, influences of other cultures of the majority countries on whose territory they lived, inevitably customization of Roma to the requirements of majority communities and other conditions of their lives, as well as the visible religious, customary and cultural differences, then the previous conclusion can be questioned. With this arguments it can be added the fact of the lack of a single Roma language, but rather dialects, which differ from each other. The educational structure and educational status of any social group significantly affects the possibility of performing a variety of social roles, working and economic, political and social. These personal or group characteristics affect the possibilities of social promotion, as well as lifestyles, social interactions and relationships and engaging in various forms of social life in the community (Milosavljević, 1993: 34- 47).

With social distance towards the Roma, majority population loses a lot of valuable experience, more than we could possibly have guessed. Part of their national identity that must be preserved and which is their tradition are: customs, cheerful nature, the richness of language, oral traditions, musicality, propensity to jokes, optimism, wisdom, survival, life experience beyond chronological age etc. (Vantić-Tanjić 2008; Saitović, 2014). These are just some of the characteristics of their own ethnic group which should be preserved as the basis for integration - inclusion. Inclusion would enable them to preserve their identity, and at the same time accept the contemporary requirements of the new millennium in terms of education and employment. This process reduces or completely suppresses social distance towards the Roma, which lasts long and is inappropriate for human relations.

On the other hand, the early inclusion of Roma children in kindergarten is an important step in combating social distance and prejudice against Roma. At an early age increased social interaction helps children to develop friendship which certainly can positively be reflected on the motivation and progression in learning. From the quality of social relations in kindergarten children, teachers, families and community members have benefits. They represent the foundation for future good relations among adults, for developing tolerance, prosociality, empathy and altruism (Kojić,

2013: 79-87).

Always immersed in another culture, Roma life is characterized by constant adjustment and acceptance of changes in the environment. This inevitably led to further disagreements in the culture, customs and language. The term Romani "nation" has more symbolic, moral and political rather than legal value. In fact, the Roma as citizens of certain countries are clearly a minority. It is therefore important for them to be treated within the law, that they be guaranteed basic rights and freedoms as to all other citizens, or to be treated as other minorities that have the right to protect their rights (Mirga, Georgi 2004: 11- 49).

Finally, it should be noted that the emancipation of the Roma in the socio-cultural and socio-psychological sense is not possible without the liberation of Roma from "their own prejudice", a non-Roma population from prejudice and from doubts about human qualities of Romani people.

4. CASE STUDY - INTEGRATION OF ROMA INTO THE EDUCATION SYSTEM

Education is most closely associated with socialization and upbringing. Socialization represents the widest process of introducing young human being in social life through various forms of learning. Education is a narrow part of a broader process of social learning in all societies and cultures which has a decisive significance. The educational status of Roma across Europe is considerably lower than the status of the population. Low educational level, on the one hand, is an obstacle to employment and ensuring the existence and the conditions for development and progress, but also leads to deepening poverty. On the other hand, poverty is certainly an obstacle for the education of children. Thus, the Roma population "for decades revolves in a vicious circle" from which it cannot come out alone. Education is the key to moving out of poverty, measures that will contribute to improving the situation of Roma have to be taken, starting with the facts and analysis of the reasons that contribute to this state of affairs (Đigić, 2007: 4). The low level of education of Roma reflects adversely on their professional structure. Most of the Roma are poor and without permanent employment, since they are uneducated and unskilled, but cannot compete in the labor market. Jobs that they can work are underpaid, unappreciated and seasonal. Many Roma are beneficiaries of social aid, which, even when regularly received, is not sufficient for basic needs (Horvat, 2008: 443-472; Jakšić, 2002: 333-335; Macura-Milovanović, 2010; Raduški, 2009: 189- 202).

Most Roma live in segregated neighborhoods that are unsanitary, often without electricity, water, located in marginalized areas of the city, on dumps and under bridges. Life in these conditions is very difficult for poor families that are unable to provide basic living conditions for many of its members, the children were not vaccinated, health care is poor, a life expectancy of Roma is significantly lower than other populations. The Roma population is the largest ethnic group that is not sufficiently present in education. Roma have a low percentage of school enrollments, low completion level of the class, even in the first four grades of elementary school, a high percentage of repetition, dropouts and very low level of continuing education in secondary schools (Macura-Milovanović, 2010).

Literacy as a basic feature of the educational structure of the population makes the elementary assumption of education process and is a good indicator of social, economic and cultural development of a social environment. In countries where illiteracy is eradicated, the issue of literacy is not covered by the census, while in our country was incorporated into the content of the current records. Serbia, unfortunately, is one of those European countries which have not yet eradicated elementary illiteracy at the beginning of the XXI century. According to the data, in Serbia there are 230 thousand illiterate persons, which is 3.4% of the total population older than 10 (Raduški 2004: 433-445). What we conclude this case study is that of the Roma in the education system in Serbia there are no reliable written records. Some of the main reasons for the lack of valid data can be lack of personal documents or registration of Roma, the mobility of many families that are looking for seasonal jobs and many other reasons. Exclusion of Romani children from the education system is a problem of enormous proportions that exists in all European societies where Romani population lives. Factors of such conditions include racism of non-Roma parents, which are opposed to the entry of Roma children in schools, discriminatory practices by educational authorities and bureaucratic procedure for enrollment in school and Roma poverty that prevents the funding of education, social and physical isolation of Roma from the society, living in segregated and ghettoized neighborhoods distant

from schools (Macura-Milovanović, 2010: 3). Education of Roma children is one of the most important issues in efforts to improve living conditions and changing socio-economic situation of Roma. As Roma syndrome irregularly going to a school and early school leaving is still present. Some think that the possibility of instruction in the Roma native language would greatly facilitate their further education, before it cause furthers discrimination, while on the other hand it is pointed out that the language barrier is not the only obstacle to regular education, but also poor financial situation of the family, education level of parents, traditions, customs and more.

For Roma who had subordinated their whole life to mere survival, children's education has no special value. Locked in their own ethnic frames, semi-literate and uneducated, they cannot help their children to achieve better success in school or in their professional advancement. In addition, there is a lack of commitment and motivation of the teaching staff for special work with Roma children, as well as accepting and misunderstanding specific life style of Roma by the wider community (Raduški, 2009: 189-202).

Inclusion of Roma into the education system and ensuring continuity of education is the first step towards improving education for Roma. With the increasing number of Roma children, youth and adults involved in the education system, Roma can have the same rate of progression through the levels of the system, as well as non-Roma children (The draft Strategy for Improving Education of Roma in Serbia, 2003: 11).

The aim of involving Roma into the education system and ensuring continuity in education the following task are defined:

1. Creation of system requirements for inclusion of Roma into the education system. Creating a body that will be responsible for the realization of this objective. Their function is reflected in the implementation of certain activities that have to contribute to the institutional inclusion of Roma and / or coordinating the work of others who participate in the process.

2. Developing a specific enrollment policy for Roma children and young people. If they do not attend preschool, Roma children until the beginning of schooling live in a culture that is significantly different from the majority, and these differences must be respected within the manner and criteria enrollment of Roma children in school, also later, at the level of secondary and higher education. The enrollment policy must pave the way for the educational system, to eliminate the differences that are the result of educational deprivation, that should not be deepened and create conditions for discrimination.

3. Preparation of educational institutions for inclusion of Roma in education. The bearers of main activities will be the local community and educational institutions. The Ministry of Education will support this process at the level of selection and implementation of different solutions to the problem of inclusion of Romani children, coordinating activities in certain institutions, and by providing additional funds for the costs of preparation and implementation of programs and didactic equipment of the institutions.

4. Preparation of Roma children for school. This includes work on the system preparation of Roma preschoolers in order to meet the demands presented by the school, and that in the future meet the standard criteria for readiness for school. It is especially important to ensure continuity in schooling. A child who is not prepared to enter the school system is hardly to be adapted and rapidly drops out of it. Preparing Roma children for school also means working with parents, from whose motivation largely depends whether the child will be enrolled in school and attend classes regularly.

5. Financial support to the Roma in education. Low socio-economic status of the Roma population is almost always on the list of factors that create obstacles to the inclusion of Roma into the education system, particularly in ensuring continuity in their education. Providing financial support to Roma in education must ensure elementary conditions that requires regular education and to flexibly follow the needs of the different levels of education.

Above mentioned five proposals certainly can enhance the educational integration of Roma, and therefore social integration of Roma in the social system, as extremely unfavorable educational structure of Roma is one of the most important cause of their disintegratedness into society, but also affects the maintenance and deepening of socio-economic and cultural gap between Roma and the rest of the population. The basic requirement for improving the socio-economic and cultural status of the Roma, and social mobility and integration into society is education. This is also the objective of case study of the Roma national minority.

Low educational level, on the one hand,

is an obstacle to employment and ensuring the existence and the conditions for development and progress, and so leads to deepening poverty. On the other hand, poverty is certainly an obstacle for the education of children. Considering that education is the key to moving out of poverty, measures that will contribute to improving the situation of Roma have to be taken. Exclusion of Roma children from the education system is a problem of enormous proportions, which will result in the generation that will continue to be illiterate and thus socially maladjusted. Therefore, the issue of Roma inclusion in the education system is one of the most current issues, especially from the standpoint of social integration, social mobility, improving of the socio-economic status and national emancipation. Inclusion of Roma into the education system and ensuring continuity of education is the first step towards improving education for Roma. With the increasing number of Roma children, young people and adults involved in the education system, Roma can be covered by an equal education system and have the same rate of progression through the levels of the system, as well as non-Roma children.

It is also important to note that low levels of parental education, which often goes hand in hand with poverty, is a source of additional negative impact on the educational achievement of a child. The level of education of parents significantly acts on the set of parental behaviors that can be linked to education and the educational achievement of children. The education level of parents is a significant predictor of parental involvement in children's education and parental expectations. Parents who have attained higher levels of education have higher expectations of their children in terms of their educational attainment. They are in a significantly greater extent involved in the education of their children and help them in mastering the curriculum. In fact, research suggests that active and supportive parenting behaviors are especially important for academic achievement of children in the first years of their formal education. The question is whether the socio-economic depression represents a unique source of differences in valuation and vision of the school, the perception of education, aspirations, attitudes and general life values of parents whose children attend the school? Are there differences that can be attributed to cultural factors and attitudes that members of a particular ethnic, ie. Roma community foster? In an effort to provide answers to these questions, a survey was carried out in order to identify attitudes towards education, aspirations and values of parents - Roma and non-Roma parents of different socio-economic status whose children attend the school. The practical significance of this research is related to the identification of specific parental attitudes that can have a disturbing influence on the adaptation of children to school and their potential educational attainment (Tovilović, Novović, Biro, 2009: 332-354). This publication is for wide-ranging audience - all those who believe or want to believe in the concept of education for all and equal opportunities in education for all children, regardless of their origin, and the current position in society. Its aim is to present one of the current problems of society through a unique case study, which sees the resolution of the problem in providing support to children in education, especially children from vulnerable social groups, such as Roma children. Children from the Roma community belong to one of the most vulnerable groups in contemporary society in Serbia, living on the margins, with little chance for success and achieving their rights and their dreams. As a democratic society, we want to change that.

5. ADVANTAGES AND DISADVANTAGES OF CASE STUDY IN THE STUDY OF THE ROMA MINORITY

Case studies include intensive study of a particular unit or system which has the characteristics of the entity, which is exactly the case with the ethnic group we observed. They allow plunge into the depths of the studied '' case '' and understanding of what lies behind the phenomenal, in the work we have done our best to present the rich descriptions of social and educational processes and phenomena, one example is the analysis of a single ethnic minorities such as the Roma. To case study become a scientific research, it must be strictly and rigorously conducted by scientific theory and should be systematic and critical, what we have in this study acknowledged relying on numerous sources that allow analyzing the characteristics of the Roma, their cultural identity, traditions, problems integration of Roma into the education system, the problem of integration of Roma in the social system. To point out the reasons for the use of case study in this research we will present different

sources of author Shulman of the case study (Shulman, 1991: 393-396):

(1) ''Case'' materials. These are the data of which is case study made, such as diaries, videos, student assignments, etc. These data can be collected and organized by teachers themselves, or other persons.

(2) ''Case'' reports. The reports gathered experience and interpretation at "the first hand". Their own teachers create and write them.

(3) ''Case'' research. This is about a specific technique of qualitative research that is close to anthropological studies. Usually organized by third parties interested in a certain pedagogical problem.

(4) ''Case'' teaching. They contain a variety of original sources, narrative notes, teaching time, interviews with teachers etc. In terms of volume, they vary from short to very extensive views.

(5) ''Case'' teaching strategies. Here is a case study of an independent teaching method used at all previously mentioned materials. As a teaching strategy, case study varies from Socratic dialogue professors and students to autodidactic case study (in which the student is guided by comments or computer program).

(6) ''Case'' manuals. Manuals are collections of paradigmatic case studies that represent a certain problem, a theme. This can be a collection of student learning, school discipline, curriculum, physical organization of the classroom etc.

(7) ''Case'' programs. The programs are the youngest category of case studies. Teaching and scientific power organized around representative case studies is presented in them.

Video recordings of different educational situations, teaching, learning, counseling are sometimes called case study. The case study describes a real problem situation and in its potential to offer not only the reactions and behavior, but also strategy, dispositions, habits of thought. The case study presents an authentic narration that illustrates a general principle, an idea, a theory.

A case study is used when the investigator has little control over events and when it comes to real problems placed in the context of a specific environment. Unlike specific targeting methods, case study addresses issues that may require a comprehensive understanding of events by using inductive logic. Before you start designing case study it is necessary to determine and select the type of case study that will be used during the research. Types of case study: describing (mainly used one or two cases an event to display the status. Describing case study is used to gain an understanding of the unknown status of a particular case), explanatory or pilot (explanatory case study is conducted prior to the implementation of large research. Its basic function is to assist in the identification of key issues and types of assessment before you start real research. The biggest lack of this type of case study is that its outputs can be so convincing that based on them premature conclusion can be brought), cumulative (cumulative case study is used to gather information from different sources and in different periods. The idea is to collect already made studies, and later do classification of conclusions, which in the end leads to generalization of final conclusion and avoiding repetition of completed studies), and critical (critical case study examines one or more cases to investigate situations that are of little importance, or more generally, do not have any, and to challenge the generally accepted assumption).

As the case study is carried out in very different areas, it is almost impossible to determine specific or universal method or manner of implementation or the design of case study. Jin (Yin, 1994) wrote about the case study and suggested techniques for successful organization and conducting the research. They proposed six steps that should be used: (1) choice of single or multiple modal approach (2) selection of participants (3) data collection (4) data analysis (5) preparing a report (6) questioning the value and reliability. These authors also emphasize the importance of clear articulation of a theoretical perspective, determining the aims of case study, case selection, selection of appropriate methods of data collection, as well as allowing certain compromises during the formation of the final report. A choice of single or multiple modal approach is used to obtain a complete picture of the case study participants, and researchers can use a variety of methods. Common methods include interviews, protocol analysis, field studies, and observations of the participants. Case studies can be used by one participant or a small group of participants.

Why did we put special emphasis on the characteristics of case study? Analysis of the cultural identity of the Roma minority, the advantages and disadvantages of integration of the Roma minority in the social system was based on very specific and individual (case) material, based on written (case) report, then (case) studies that have been conducted, and strategy proposal of improvement of the edu-

cation of Roma who are here methodologically classified as (case) program, which should not be left out when it comes to the integration of Roma into the social system. Case studies, as already stated, we use in specific cases, when the investigator has little (or none) control when it comes to issues of specific environment. Therefore, the emphasis in this study is on very specific subject of research (Roma national minority), the sample and the selection of study participants (members of the Roma minority), data analysis (written documents about the Roma population), evaluation of the value of research (theoretical and empirical contributions to status of Roma in the social system of the Republic of Serbia).

Now it's quite clear why is Case Study method selected, because it is a completely separate ethno-cultural subject of research, and that is the Roma minority, which should and must be integrated into our democratic society with the absence of any prejudice or steorotip.

6. CONCLUDING REMARKS

The historical experience of different groups has prompted a huge variety of cultural and social characteristics. The feeling of closeness and community of Roma and non-Roma nation exists, but it is evidently threatened by hostility that is often manifested by non-Roma society.

The appeal is to accept the concept of multi-ethnicity and multiculturalism which would allow different ethnic communities to preserve their own national identity, ethnic, religious and cultural characteristics without precluding the possibility of adapting their successful integration into society itself.

Researchers are studying the input data using many interpretations to find a connection between the subjects of research. Used multiple methods of data collection and a number of techniques of their analysis give researchers the ability to triangulate information in order to support the results and conclusions of the research. Appropriate case study reports on the collected data so that complex issues are transformed into easily understandable allowing the reader to wonder and explore study and thus to come to an independent conclusion. Researchers pay special attention to emphasizing sufficient evidence. Once the key variables are identified, they can be analyzed. At this stage of case study, reliability plays a key role, many researchers go a long way to ensure the reliability and value of their interpretation of the collected data. It is important to repeat that the case study is scientific method that has its own laws and rules.

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Conflict of interests
Authors declare no conflict of interest.

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CONTINUOUS QUALITY IMPROVEMENT (CQI) FRAMEWORK: A CASE OF INDUSTRIAL ENGINEERING DEPARTMENT

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ABSTRACT

This paper aims to present an educational framework for outcomes based continuous quality improvement. Well defined program outcomes, program educational objectives and assessment process have been developed to ensure graduates' outcomes achievement. Direct and indirect tools have been used for assessment process. Course evaluation surveys, alumni surveys, and employer surveys have been deployed for indirect outcome assessment. Exams, quizzes, assignments and projects, on the other hand, have been used for direct outcome assessment. In developed framework, the educational processes committees and facilities committees have been integrated to continuously evaluate and monitor the educational processes. Furthermore, program outcomes and course learning outcomes are proposed to be evaluated and continuously monitored by programs goals committee and continuous course improvement committee respectively. Forms and procedures have been developed to assess student outcomes.

1. INTRODUCTION

International engineering alliance (IEA) gave a signatory status of Washington Accord (WA) to Pakistan Engineering Council in 2010. (Manual of accrediation Engineering Accrediation Board, 2014). Before 2002, the Washington Accord was based on conventional education system widely known as input based education system. The major problem associated with conventional education system was non-provision of feedback; which was major hindrance in continuous quality improvement (Patil and Codner, 2007). After the identification of drawbacks in conventional education system, Washington Accord adopted outcome based education system in 2002 (Laguador and Dotong, 2014). After obtaining signatory status in 2002, Pakistan Education Commission faced the major challenges of conversion of their education system from conventional to outcome based system.

To overcome this issue, there was a need of continuous quality improvement framework for outcome based education implementation. The framework was required to integrate course objective, curriculum mapping, direct/ indirect measure and continuous course quality improvement (CCQI) as a single entity.

The paper aims to propose a continuous quality improvement framework for engineering education in Pakistan. The paper is structured as follows. Literature review has been presented in Section 2. Section 3 describes the methodology adopted for the development

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of framework. The proposed framework has been provided in Section 4.

Section 5 presents the results and analysis obtained by the application of proposed framework for a specific course. Finally Section 5 and 6 present conclusions and recommendations respectively.

2. LITERATURE REVIEW

Outcome based education is a newly developed model for the improvement of quality education. (Rajaee et al., 2013). It focuses on teaching and learning based on desired student's learning outcomes (Spady, 1994). To achieve these outcomes, assessment and performance standards have been designed and implemented (Spady, 1994). Literature review highlights the significance of outcome based education (Borsoto et al., 2014). Furthermore it serves as competitive advantage among different countries (Spady, Marshall and Kit, 1991).

In past centuries, two major education systems have been proposed namely (i) problem based learning, and (ii) project based learning. Problem based learning is a student centered learning approach. It encourages teachers to be facilitators instead of disseminators. It is based on open ended problems which serve as initial stimulus (White, 2001). Project based learning, on the other hand, aims to engage students in authenticated problems investigation. It is based on project with the objective to provide learning (Blumenfeld et al., 1991). Both traditional educational systems focus on contents with predefined curriculum and assessment system. Outcomes based education system, on the other hand, is relatively a new system which is based on defined framework for outcomes (Spady, 1994) i.e. it focuses on student's outcomes and skills they must possess in future (Spady, Marshall and Kit, 1991). In this system, curriculum, assessments, instructional strategies and performance standards are developed and implemented to meet desired outcomes (Spady, 1994).

Outcome based education includes (i) program educational objectives (PEO's), (ii) program learning outcomes (PLO's), (iii) stakeholders involvement in defining PEO's and PLO's, a well curriculum development to achieve desired program educational objectives and program learning outcomes, (iv) courses mapping to program educational objectives and program learning outcomes for contribution and development of continuous improvement process (Rashid, 2012).

Program educational objectives describe career and professional success that students attain after graduation (Manual of accrediation Engineering Accrediation Board, 2014). It is classified in to six categories namely (i) knowledge, (ii) comprehension, (iii) application, (iv) analysis, (v) synthesis and (vi) evaluation (Student Outcomes and Program Educational Objectives, 2015). Program learning outcomes have to be attained by students at the time of degree completion and must be specific, measureable, achievable, realistic, and time-based (Kapfer, 1971).

Assessment is the third step which aims to defining clear and measureable outcomes, ensuring opportunities to achieve these outcomes, implementing an evaluation system and then use results from evaluation for student learning improvement (Bresciani, 2006). Many direct and indirect assessment tools have been proposed in literature. Direct assessment tools include course assessment, student satisfaction survey, cumulative GPA index for course, basic exams, senior design project, and program accreditation (Sekhar et al., 2008). Senior exit survey is an indirect program outcomes assessment tool (Othman et al., 2011). Teacher evaluation is a tool that can be used for the evaluation of teacher performance (Chalmers and Gardiner, 2015) by student feedback which helps to improve teaching skills. Teacher training programs are also designed on the basis of evaluation which aid to enhance teachers' performance (Boerbooma et al., 2015). Rubrics is another indirect assessment tool that can be used for student's skills and course assessment (Almarshoud, 2011). Core indicators affecting academic institution are prioritized in three layers. Leadership, quality of faculty and infrastructure facilities reside at first layer. Quality of students, research, and learning environment are in second layer followed by strategic planning, governance, assessment procedures and market force as the third layer (Jahanzaib and Akhtar, 2005).

Review of literature presents that there exists a number of outcome based education models and continuous improvement frameworks. Bloom and his colleague Maser worked on behavioral objectives and developed taxonomies of the objectives for cognitive and effective domain (King and Evans, 1991). Davis adopted Carroll and Bloom's work to achieve desired educational reform (Davis, 2003). The developed framework con-

sists of three phases. First phase of framework involves program and course objectives development; Second phase includes defining student learning outcomes based on Bloom's taxonomy of cognitive domain followed by third phase involving assessment workshops to familiarize faculty and administration with assessment techniques (Mcgourty et al., 2002). Besterfield proposed a conceptual model for quality improvement in engineering education and developed program outcomes using affinity diagrams (Besterfield-sacre, Shuman, and Wolfe, 2002). Volkwein, Lattuca and TereNzini developed a conceptual framework to examine impact of ABET's EC200 impact on student's learning outcomes (Volkwein, Lattuca, and TereNzini, 2004). Malaysian institute of information and technology developed a computerized system to link, asses and measure course learning outcomes and program learning outcomes (Mokhtar et al., 2014). Beside these typical assessment models a new program outcomes assessment model focusing on performance criteria for each program outcome. The researcher discouraged the use of grades as performance indicators (Mohammad and Zaharim, 2012). A continuous improvement program based on outcomes based education comprised of student's outcomes assessment tools have been developed and implemented by Sekhar, C. R. et all. (2008). An outcome driven hybrid academic model was proposed by Bouslama et al (2003). It uses grade point average along with outcomes driven students output. The model consists of learning outcomes, use of e-portfolios to record student achievement, assessment and its reflection and closed feedback learning communities.

From the detailed literature review, it can be seen that number of authors have proposed outcome based education implementation models. However, it must be noted that systematic implementation of framework is required to fully achieve objectives of outcome based education. Engineering education institutions in Pakistan are bound to follow outcome based education in true spirit to get accreditation from Pakistan engineering commission. Therefore this research has proposed outcome based education continuous quality improvement framework. This will help the engineering institutions in Pakistan to apply outcome based education in true manners.

3. METHODOLOGY

This research explores the continuous quality improvement framework for outcome based education implementation in engineering institutions of Pakistan. The methodology consists of five phases. Literature review has been conducted in first phase to identify the limitations of previously developed frameworks. After identifying the gaps in phase 1, a framework has been proposed in phase 2. The framework aligns the classroom practices and educational structure. A specific course was selected in phase 3 for the implementation of framework. Analysis of the course assessment data was conducted during phase 4. Finally, improvement methodology was suggested in phase 5 for continuous quality enhance.

4. PROPOSED FRAMEWORK

An outcomes assessment and continuous improvement framework based on above mentioned methods are proposed to ensure program educational achievement. The proposed framework has been presented in figure 1.

The proposed framework consists of three modules namely (i) Outcome module, (ii) management module and (iii) assessment module. Outcome module defines the targeted outcomes and it consists of program educational outcomes, program earning outcomes and course learning outcomes. Assessment module assesses the fulfillment of the targeted outcomes based on certain criteria. Management module consists of monitoring and evaluation committees for continuous improvement. Three suggested committees are: (i) Continuous course improvement committee (CCI), (ii) program goals committee (PGC) and (iii) education facilities and processes committee (EFPC).

Significant feature of proposed framework is indicated by three layers of outcomes assessment cycles.. These cycles includes (i) course learning outcomes assessment, evaluation and continuous improvement cycle, (ii) program learning outcomes assessment, evaluation and continuous improvement cycle and (iii) program educational objectives assessment, evaluation and continuous improvement cycle.

First cycle encloses course learning outcomes assessment and improvement cycle. Closing the loop takes sixteen weeks (one semester). The second cycle program outcomes

assessment cycle is a slow process and takes one year. Third cycle is program educational objectives assessment and improvement which is also slow in nature. This cycle take four years to close it. Stakeholders (students, alumni, industry, parents, and faculty) provide input in form of surveys, gathered data is analyzed to review and modify PEO's and PLO's.

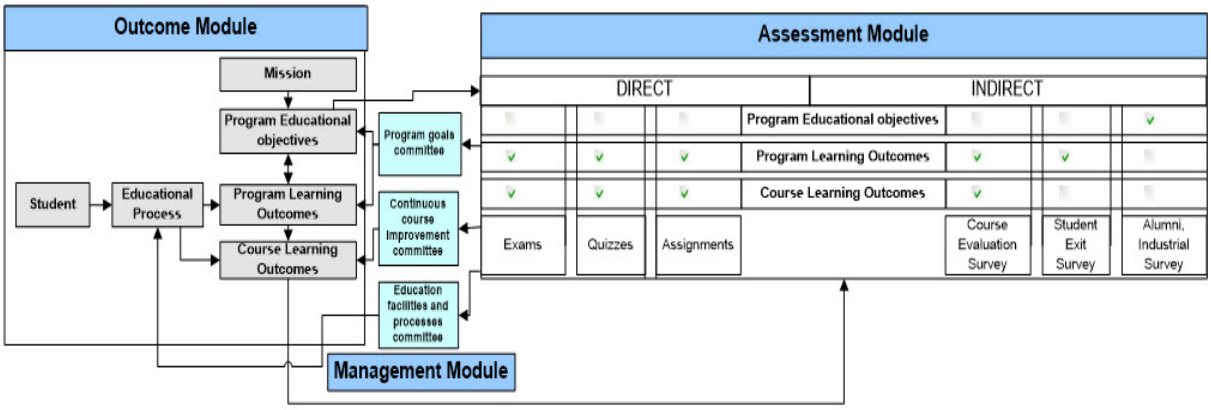

Figure 1. Outcomes Based Education Continuous Quality Improvement framework

Outcomes Assessment methods used to evaluate outcomes according to developed framework are direct assessment and indirect assessments. Direct assessment includes outcomes assessment (e.g. course learning and program learning outcomes). Indirect assessment, on the other hand includes student's course completion survey, exit survey, alumni survey and employer survey

These assessment processes may be used to improve outcomes, course contents, curriculum and educational processes to achieve targeted outcomes. Teacher evaluation survey may be used to evaluate teacher performance.

Following sections explains the implementation of the proposed framework for course assessment and continuous improvement. The implementation starts with setting target outcomes (PEO, PLO and CLO), PLO/CLO mapping, assessment and feedback for improving outcomes. All procedures been discussed separately below.

4.1. Setting target outcomes

This step involves setting target program educational outcomes, program learning outcomes and course learning. Program learning outcomes are statements which detail skills and abilities undergraduate students must achieve at time of degree completion. Program educational objectives and program learning outcomes have been developed as per Pakistan engineering council's guidance and are presented in table 1. Each course in the entire industrial Engineering curriculum contributes to achieve some or many of the program learning outcomes. Correlation of current Industrial engineering courses with program learning outcomes has been presented in Annexure 1. For more detailed analysis, correlation of program learning outcomes of one of the selected course "Metal forming and cutting analysis" is shown in table 2.

Table 1. Program educational objectives and program learning outcomes

	Program Educational Objectives
a.	To produce Industrial Engineers who assume challenging managerial and leadership roles in Manufacturing and Service sectors both at National and International Levels
b.	To provide Employers with graduates who remain at forefront and are technically competent; have interpersonal, decision making and problem solving skills to enhance effectiveness
c.	To produce professionals who recognize that engineering is a global service profession that must be practiced ethically, with integrity, honesty, and objectivity
	Program Learning Outcomes
a.	Engineering Knowledge: An ability to apply knowledge of mathematics, science and engineering to solve complex problems.
b.	Problem Analysis: An ability to identify, formulate, solve and analyze engineering problems.
c.	Design/Development of Solutions: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d.	Investigation: An ability to investigate complex engineering problems systematically such as literature review, design and conduct experiments, analysis and interpretation of experiments to derive valid conclusion
e.	Modern Tool Usage: An ability to create, select and apply appropriate techniques, skills, and modern engineering tools necessary for engineering practice
f.	The Engineer and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems
g.	Environment and Sustainability: An ability to understand the impact of engineering solutions in a global, economical, societal context, environmental and sustainable development
h.	Ethics: An ability to understand ethical and professional responsibilities
i.	Individual and Team Work: An ability to work effectively as an individual or in a team
j.	Communication: An ability to communicate effectively
k.	Lifelong Learning: An ability to recognize the need for innovation and technological development and to engage in life-long learning
l.	Project Management: An ability to apply concepts of industrial system and process design, ergonomics, engineering management, product development/manufacturing and analysis tools to work in a team effectively and to manage projects in multi disciplinary environments

Table 2. Program learning outcomes for Metal forming and cutting analysis

PLOs	PLOs Statements
PLO 1:a	an ability to apply knowledge of mathematics, science and engineering to solve complex problems
PLO2:b	an ability to identify, formulate, solve and analyze engineering problems
PLO3:c	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
PLO4:e	an ability to create, select and apply appropriate techniques, skills, and modern engineering tools necessary for engineering practice

A set of measureable course learning outcomes are required to drive the course. A sample of course learning outcomes developed for the course "Metal forming and cutting analysis" are shown in table 3. CLO's are developed on account of skills students must possess by the course completion. Course experts took sixteen weeks to deliver course contents assisting achieve course learning outcomes.

Table 3. Course learning outcomes for Metal forming and cutting analysis

CLO's	CLO's statements
CLO 1	Recalling the concepts of Manufacturing Processes for in-depth knowledge of processes for enhanced learning, **Understanding**
CLO 2	Identification of the known parameters in forming and cutting processes and making efficient use of boundary conditions **APPLY**
CLO 3	Be able to apply related conditions (of parameters) and obtaining an appropriate solution within given constraints **EVALUATE**
CLO 4	Reinforce evaluation capability for further synthesis of problems in metal forming cutting analysis for creation of products if any **CREATE**

4.2. Correlation between Program learning outcome and course learning outcome

Correlation assessment between course and program learning outcome allow program to know course contribution to outcomes but it do not allow assessment of specific outcomes achievement. For its assessment program learning outcomes are divided into number of measureable statements to identify student's performance required to meet outcomes. These measureable statements are called performance criteria. For example PLO j "an ability to communicate effectively" would require criteria i.e. (i) effective presentation (ii) effective writing (iii) professional communication mastery. These three criteria require three types of assessments and measurement.

Graduate must achieve all program outcomes by the end of degree completion which calls for a procedure to measure program learning outcomes by course completion. To measure PLO's course learning outcomes are mapped to program learning outcomes by a linking matrix. In this way PLO's are measured by accumulated sum of CLO's. For continuous improvement course learning level monitoring is required to make sure contents delivered and assessed are in accordance with course complexity level or vice versa so, course learning outcomes (CLO's) are mapped with Bloom's taxonomy. In addition, course contents, teaching methods and assessment methods need to be documented and continuously monitored. Student satisfaction surveys conducted after course completion assist teaching learning methods, assessment methods and course contents continuous improvement where as a documentation procedure shown in table 4 is developed which helps reviewing teaching learning methods, course contents and assessment methods in case of any CLO failure.

Table 4. Curriculum mapping

CLO's	PLO's	Learning Level	Course contents	Teaching methods	Assessment method
1	a	Understand	Introduction to MFCA, joining processes and wear theory	Lecture, presentations,	Quiz, Home work
2	b	Apply	Orthogonal Cutting Model in Machining, Merchant Equation, Surface Finish and cutting Tools Technology, Plastics extrusion, sheet metal cutting	Lectures, presentation, discussion	Quiz, Home work
3	c	Evaluate	Forces calculations in metal cutting for evaluation, Forging analysis for pressure evaluation in billets, sheet metal cutting, grinding or machining process evaluation	Presentations, discussion	Quiz, Homework, Exam
4	e	Create	Mini Project/Capstone project	Discussion	Presentation

Under a course offered by a degree program course learning outcomes are required to be directly and indirectly assessed and measured. Table 5 shows procedure assisting outcomes measurement process. Assessments are the instruments used by instructor to assess student's skills. One assessment method used for assessing a CLO is suggested but in present case instructor used more than one method to assess single CLO's. Table 5 shows a matrix linking assessment questions to CLO's to measure each CLO separately in addition with performance criteria for each assessment.

Table 5. Mapping assessments with CLO's

Assessment techniques		question	CLO	Performance criteria
Home work	HW 1	5 Qs	2	an ability to apply knowledge of mathematics, science and engineering to solve complex problems
	HW 2	5Qs	2	an ability to identify, formulate, solve and analyze engineering problems
	HW 3	5 Qs	2,3	an ability to create, select and apply appropriate techniques, skills, and modern engineering tools necessary for engineering practice
Quiz	Quiz 1	2 Qs	1,2	an ability to apply knowledge of mathematics, science and engineering to solve complex problems
	Quiz 2	2 Qs	2	an ability to identify, formulate, solve and analyze engineering problems
	Quiz 3	2 Qs	3	an ability to create, select and apply appropriate techniques, skills, and modern engineering tools necessary for engineering practice
Exam	Mid-term exam	Q1	--	--
		Q2	2	
		Q3		an ability to identify, formulate, solve and analyze engineering problems
		Q4	3	an ability to create, select and apply appropriate techniques, skills, and modern engineering tools
		Q5	3	necessary for engineering practice
		Q6		
Any other	Mini Project	--	4	ability to create, select and apply appropriate techniques, skills, and modern engineering tools necessary for engineering practice
				ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems

4.3. Outcome assessment

Course instructors must decide to setup instruments to assess course learning outcomes in their course. In present case Student's skills and abilities are directly assessed by homework's, quizzes, exams and projects.

Indirect assessments are student's perception based assessments on their outcomes achievement and understanding. Program learning outcomes (PLO's)and course learning outcomes (CLO's) are indirectly assessed by student's satisfaction survey conducted after course completion. Student satisfaction survey was composed of two parts;1) Achieving of learning outcomes 2) course management. For this purpose likert scale (1-5) was used and students were asked to rate understanding of each CLO and PLO and course management which is described later.

To evaluate student's outcomes a threshold indicator is required to make sure achievement of outcomes up to a certain level. This is to mention that student needs to obtain 60 percent marks to achieve desired program and course learning outcomes while 60 percent students must achieve course and program learning outcomes for a course to be successful. To measure particular course learning outcomes for a student ،marks obtained by student are tabulated in excel form and then converted to percentage form. Then successful student's percentage for particular CLO under the course is calculated to find achievement. Achievement indicators for outcomes are as follows:

- 90-100 % fully achieved
- 80-90 % excellently achieved
- 70-80 % achieved
- 60-70 % satisfactoilry achieved
- Below 60 % failed

In case of course learning outcome (CLO's) correlation with single program learning outcome (PLO's) its data is directly used for PLO measurement but in multiple CLO's correlation with single PLO case, weight must be defined for each CLO i.e. Percentage contribution of CLO to achieve corresponding

PLO and final marks are composite sum of individual CLO's at specific percentage and normalized to 100 percent. PLO achievement percentage is then measured by accumulating relevant CLO's data according to defined weights. Present case is an example of single CLO's correlation with PLO. Mathematical model for PLO measurement is given below

Step 1: $\forall \quad i$ determine percentage scores of students

Step 2: $\forall \quad i$ compute the average percentage of scores to get ACO_i average points

Step 3: $\forall \quad i$ assign percentage weightages w to each j

Step 4: Compute the sum of weightages by

$\sum_{i=1}^{C} w_{ij} \ , \ \forall \quad j$

Step 5: Compute the sum of $\sum_{i=1}^{C} w_{ij} \times ACO_i \ , \ \forall \quad j$

Step 6: Get the PO contribution by

$$\frac{\sum_{i=1}^{C} w_{ij} \times ACO_i}{\sum_{i=1}^{C} w_{ij}}, \ \forall \quad j$$

5. RESULTS AND ANALYSIS

Figure 2 shows outcomes achievement for "Metal forming and cutting analysis" course. As course learning outcomes (CLO's) mapping with program learning outcomes (PLO's) shows one to one correspondence so the graph shows results for both PLO's and CLO's. It can be seen from figure 2 that successful student's percentage is greater than 60% for all PLO's so the course is successfully completed with achievement of all CLO's and PLO's.

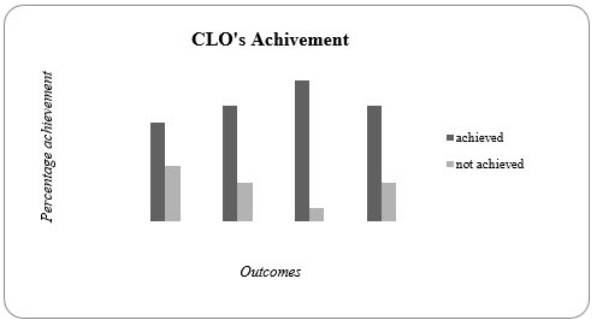

Figure 2. Course Learning Outcomes attainment

5.1. Direct and indirect assessments result comparison

Direct and indirect assessments need same basis of performance indicators to allow comparison. So Direct assessments percentage marks were converted to indirect assessment scale. For this purpose students percentage marks were divided by 20 to convert in to a linier scale i.e. 1 - 5. Performance indicators for assessments are set as: For an outcome to be successful both direct and indirect assessment calculated value must be greater than three. Direct and indirect assessment results agree with indirect assessment results as given in table 6 and 7 which show students actual learning and understanding. It is evident to say that direct and indirect assessments are the instruments to assess student's outcomes.

Table 6. CLO's direct and indirect assessment comparison

CLO	Direct assessment		Indirect Assessment		Remarks
	Successful students %	Scale=5	Mean	Standard deviation	
1	63	3.1	4.3	0.8	Successful
2	75	3.7	4.3	0.6	Successful
3	91	4.5	4.3	0.6	Successful
4	75	3.7	4.1	0.6	Successful

Table 7. PLO's direct and indirect assessment comparison

PLO	Direct assessment		Indirect assessment		Remarks
	Successful students %	Scale=5	Mean	Standard deviation	
a	63	3.1	4.2	0.7	Successful
b	75	3.7	4.3	0.7	Successful
c	91	4.5	4.0	0.9	Successful
e	75	3.7	4.0	0.9	Successful

5.2. Measuring Course level by using Bloom's taxonomy

Engineering courses are being taught in an order of learning level and complexity i.e. higher learning level course is offered in higher semester. Continuous quality improvement calls a procedure for course learning level assessment for each course offered. To ensure the achievement of acceptable course level by an 6instructor, selected course learning level was examined by mapping assessment questions to Blooms taxonomy. The frequencies of cognitive levels of assessment questions are given in table 8 for the specific course. It can be seen that 52% questions used for assessments were at understanding level, 8.6 % at application level and analyzing level, 21 % at evaluation level and only 8.6% at synthesis level. Maximum marks percentage of each cognitive level

was evaluated. It can be established from table 8 that the course "metal forming and cutting analysis" was taught at 5th level of learning.

Table 8. Assessing course learning level

Questions Level (Blooms)	Questions frequency	Percentage	Max marks	Percentage
Knowledge	0	0	0	0
understanding	12	52.17	5.75	19.16
applying	2	8.6	1	3.3
analyzing	2	8.6	8	42.6
evaluation	5	21.7	12.25	40.8
synthesis	2	8.6	8	26.6
total	23	100	30	100

5.3. Course evaluation

Review of literature resulted in factors affecting student's performance as shown in table 9 which are categorized into two parts: (1) outcomes and (2) course management. Former assesses course and program learning outcomes while later assess course contents, teaching learning methods and assessment methods. To assess course management Likert scale 1-5 has been used. Table 9 details the means scores and standard deviation obtained in result of course evaluation survey analysis after course completion.

Table 9. Course Evaluation survey

Factors affecting student performance		Mean	SD
Course objective	* Clearly expressed	4.0	0.7
PLO	* Attainment	3.8	0.8
Course contents	* Strengthened course understanding * Helped achieving course objectives * Comprehensive	4.0	0.8
Teaching learning methods	* Enhanced skills and abilities relevant to course	4.1	0.9
Assessments	* assessed CLO's * assessed Strength and weakness * helped Learning * Level was appropriate to given credit,	3.9	0.9
CLO	* Attainment assessment	4.02	0.8

5.4. Teacher Evaluation

Review of literature resulted in multiple teacher traits resulting positive students learning outcomes which can be stated as maintaining positive learning climate, class instructions, class management, and student involvement in class, teaching/learning and student differentiation. Table 10 details mean scores and standard deviation obtained in result of teacher evaluation after course completion.

Table 10. Teacher Evaluation survey

Teachers traits affecting students performance		Mean	SD
Learning Climate	* Student's respect * Relaxed learning environment * Support for Class participation * Student collaboration	4.6	0.6
Class instruction	* Declared lesson objective * Well structured lesson * Communication skills * Students comprehension	4.2	0.8
Class management	* Lecture's start and finish time * Appropriate Students progress evaluation techniques * Class room rules	4.2	0.7
Student involvement in class	* Critical thinking encouragement by asking questions * Student's interest in class * Students competition	4.1	0.7
Teaching as learning	* Encourage students to think on solutions * Apply learning practically * Problem solving strategies * Challenging assignments	4.1	0.8
Student differentiation	* Boost weak student's self confidence * Additional instructions time	3.3	1.3

6. CONCLUSIONS

Due to requirement imposed by Washington accord agreement, engineering education in Pakistan is in the phase of transformation from traditional education to object based education system. Program learning outcomes assessment and evaluation is mandatory now for all engineering programs in Pakistan. In order to ensure that the graduates of industrial engineering department have achieved program educational objectives, an outcomes based accreditation continuous improvement framework has been presented. The assessment of engineering courses with respect to learning outcomes and student's expectations is an important activity regarding course improvement. Therefore course learning outcomes were directly and indirectly assessed. It was found that the proposed method has the ability to gauge achievement of student's outcomes. Strengths of the model include; (i)

clearly defined performance criteria which are evidence for specific program educational objective, (ii) performance criteria is linked with evidence, (iii) use of performance indicators instead of grades.

Continuous quality improvement can be implemented based on these strengths. Proposed method is a close loop model equipped with continuous quality improvement.

7. SUGGESTIONS AND RECOMMENDATIONS

The findings of this research include:

- The developed framework facilitates continuous quality improvement while developed forms and procedures assess students' outcomes.
- Student exit, alumni and employer surveys are tools to evaluate outcomes at program level while course evaluation survey is an instrument to evaluate outcomes at course level.
- Student exit, teacher evaluation, and course evaluation survey are instruments to improve educational processes assisting attain educational objectives
- Program goals committee evaluates and monitors outcomes at program level while educational processes and facilities committee evaluate and monitor program performance by conducting surveys. Continuous course quality improvement committee is recommended to overcome course weaknesses.

Procedure to improve course followed by Program outcomes assessment tools are described below

7.1. Continuous course quality improvement

The results analysis section showed both direct and indirect measures for the course selected. It is evident from direct and indirect measures that course is successful but some percentage of students failed in program learning outcome "a", "b", "c" and "e". There is need for continuous course quality improvement monitored by *CCQI* committee to minimize failure percentage for same course next time. Given below methods are recommended/ suggested to figure out failure reasons.

7.1.1. Failure patterns

To address this issue continuous course improvement committee (CCQI) committee systematically must use set of information related to course and its prerequisite's course:

(1) outcomes correlation with the prerequisite and present course

(2) Students failure percentage in prerequisite

(3) switch from very low learning level (for pre-requisite) to very high learning level (present course)

(4) pre-requisite Course contents

(5) Level assessed in pre-requisite course exams.

7.1.2. Issues related to student failure

Survey may help identify issues related to student failure i.e. poor course management or student's personal problems. In case of poor course management actions must be taken to improve course.

7.2. Program Learning Outcomes (PLO's) and Program Educational Objectives (PEO's) assessment tools

Program learning outcomes and program educational objectives need to be continuously assessed and monitored. Several tools have been developed to indirectly assess student's outcomes at the time and after degree completion. Following section describe complete details of tools used for indirect assessment.

7.2.1. Student Exit survey

Review of literature resulted in number of factors affecting academic institutions performance and highlighted significance of student exit survey to evaluate institution performance and assess student's outcomes. Factors affecting academic performance can be stated as: (1) Education quality (2) Facilities and (3) Curriculum. Student exit form has been developed and categorized in to two sections: (1) Assessment of outcomes and (2) Academic performance evaluation. Table 10 show all factors enclosed in student exit survey in detail.

7.2.2. Alumni survey

Alumni form also consists of two sections: (1) PEO's assessment and (2) alumni career. First section assesses outcomes while second section deals with graduate satisfaction with career, employment status, confidence in work and commitment to lifelong learning. Table 10 show all factors enclosed in Alumni survey in detail.

7.2.3. Employer survey

Employer form has been developed to collect employer's views about alumni performance, employed at industries in addition with industry demands i.e. which skills employers demand for an engineer to be employed at their organizations. Program educational objectives and program learning outcomes assessment in addition with modification to compete globally is purpose of employer form as shown in table 11.

Table 11. Student exit, Alumni and Employer survey

	Factors	
Student Exit survey	Knowledge Skills and attributes	• clearly declared • Attainment assessment • Modify /delete/add
	Education quality	• Instructions quality and knowledge • Professional practices development
	Facilities	• Computational facilities • Laboratory facilities • Equipment needed for a modern education • Library holdings
	Curriculum	• Team projects and discussions • Missing material • Unnecessary material • Career development
	General opinions	• Important skills learned during graduation
Alumni Survey	program educational objectives	• Meet newly admitted students • Modify/ delete / add
	Satisfaction with career	• Current employment position • Successful Career
	Graduate employment statuses	• Find job within 1 year after graduation
	Confidence in work	• Job is closely related to education • Skills fulfill job demand • Engineering courses that need improvements • Missing material
	Commitment to lifelong learning	• professional society member • Enrolled in education
Employer survey	Knowledge Skills and attributes	• Academic and professional preparation • Industrial skills demand • Modify/delete/ add
	Program educational objectives	• Role in global Business • Attainment assessment • Modify/delete/add
	General assessment	• Suggestions to improve

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Conflict of interests

The authors declare no conflict of interest.

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Annexure 1. Correlation Matrix

Course		Program Learning Outcomes										
Course Code	Course Title	a	b	c	d	e	f	g	H	i	j	k
IE-101	Problem Solving for Industrial Engineers	SWC	SC	NC	SC	SC	SWC	NC	SWC	SWC	SWC	SWC
IE-102	WorkShop Practice	SC	SC	SWC	SC	SC	NC	SWC	SC	NC	SWC	SWC
ME-191	Engineering Drawing and Graphics	SC	SC	SC	NC	SC	NC	NC	NC	NC	NC	SWC
ME-292	Mechanical Technology	SC	SC	SC	SC	SWC	NC	NC	NC	NC	SWC	NC
MA-191	Calculus	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SWC	NC
MA-192	Differential Equations	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SWC	NC
CS-192	Introduction to Computing	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SWC	SWC
HU-112	Islamic Studies / Ethics	NC	NC	NC	NC	NC	NC	SC	NC	SWC	SC	NC
IE-121	Probability and Statistics	SC	SC	SC	SC	SWC	NC	NC	NC	NC	SWC	NC
IE-122	Computer Aided Design & Modeling	SC	SC	SC	NC	SC	NC	NC	SWC	NC	SC	SWC
IE-231	Engineering Management	SC	SC	SC	SWC	SWC	SWC	SC	SWC	SWC	SC	NC
ME-221	Engineering Mechanics	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SWC	NC
HU-101	Applied Physics	SC	SC	SC	SC	SWC	NC	NC	NC	NC	SWC	NC
ME-293	Materials Engineering	SC	SC	SC	SWC	SC	SWC	NC	NC	NC	SWC	SWC
MA-193	Applied Linear Algebra	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SWC	NC
IE-241	Engineering Economics	SC	SC	SC	SWC	SC	SC	NC	SWC	NC	NC	SWC
IE-243	Operations Research	SC	SC	SC	SWC	SC	SWC	NC	NC	NC	SWC	SWC
IE-242	Manufacturing Process	SC	SC	SC	SC	SC	SWC	NC	NC	NC	SWC	SWC
HU-113	Pakistan Studies	NC	NC	NC	NC	NC	NC	SC	NC	SC	SWC	NC
ME-294	Mechanics of Materials	SC	SC	SC	SC	SWC	SWC	NC	NC	NC	SWC	NC
EE-301	Industrial Electronics	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SWC	SWC
IE-311	Operations of Manufacturing Systems	SC	SC	SC	SWC	SC	SWC	NC	SWC	NC	SWC	SWC
ME-311	Applied Machine Design & FEM 2 1	SC	SC	SC	SC	SC	SWC	NC	SWC	NC	SWC	SWC
IE-312	IE-312 Metrology & Statistical Quality Control 3 1	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SC	SWC
IE-313	IE-313 Optimization Techniques 2 0	SC	SC	SC	SWC	SC	SWC	NC	NC	NC	SWC	SWC
IE-314	IE-314 Work Study & Methods Engineering	SC	SC	SC	SWC	SC	SWC	NC	SWC	SWC	SWC	SWC
IE-321	Industrial Simulation 2 1	SC	SC	SC	SWC	SC	SWC	NC	SWC	NC	SC	SWC
IE-322	IE-322 Human Factors Engineering 2 1	SC	SC	SC	SWC	SWC	SC	SWC	SWC	SWC	SC	SWC
IE-323	IE-323 Management of Engineering Projects 3 0	SWC	SC	SWC	SWC	SC	SWC	SWC	SC	SC	SWC	SWC
MA-391	MA-391 Numerical Analysis 3 0	SC	SC	SC	SWC	SC	NC	NC	NC	NC	SWC	NC
IE-324	Planning & Scheduling in Manufacturing 2 0	SC	SC	SC	SWC	SC	SWC	NC	SWC	NC	SWC	SWC
IE-325	Industrial Automation and Robotics	SC	SC	SC	SWC	SC	SC	NC	SWC	NC	SC	SWC
IE-411	Design of Experiments 3 1	SC	SC	SC	SC	SC	SC	NC	SWC	NC	SC	SWC
IE-412	IE-412 Industrial Facilities Design 2 1	SC	SC	SC	SWC	SC	SC	NC	SWC	NC	SWC	SWC
IE-XXX	IE-XXX Elective I (HRM)	SWC	SWC	SWC	SWC	SC	SWC	SWC	SC	SC	SWC	SWC
IE-XXX	IE-XXX Elective II (Metal forming an cutting analysis	SC	SC	SC	SWC	SC	SC	NC	NC	NC	SWC	SWC
IE-491	IE-491 Project Phase I	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC
IE-XXX	Elective I (Organizational behavior	SWC	SWC	SWC	SWC	SWC	SWC	SC	SC	SWC	SWC	SWC
IE-XXX	IE-XXX Elective I (Automation and ctrl)	SC	SC	SC	SWC	SC	SC	NC	SWC	NC	SC	SWC
IE-XXX	IE-XXX Elective II (CIM)	SC	SC	SC	SWC	SC	SC	NC	SWC	NC	SC	SWC
IE-XXX	IE-XXX Elective											
IE-492	IE-492 Project Phase II	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC	SC

SC: Strongly correlated, SWC: Somewhat correlated, NC: Not correlated

ANALYSING A LARGE AMOUNT OF DATA AS A DECISION SUPPORT SYSTEMS TOOL IN NIGERIA ORGANISATION

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ABSTRACT

Big Data, as a Decision Support Tools in numerous firms, has offered the capacity to assemble, store, access and investigate massive measures of information (data) so that better choice of decisions can be made with respect to clients, providers, employees, logistics, and framework. Contrasts in the utilization of Information Technology (IT) have been found in various countries, thus it is important to lead a far reaching investigation of the encouraging and repressing components (factors) in the adoption and diffusion of BDDSA in Nigeria. The point of this review was accordingly to fill the hole by exploring factors influencing the effective selection of BDDSA in Nigeria MIS (Management Information System) user organizations.

1. INTRODUCTION

Big data has become a buzzword of business sand its drawbacks and promise are acquiring, developing attention from the media and industry worldwide. The vast amount of data gathered, transferred and stored by new techniques is reshaping priorities for several businesses and the growth of new tools of analytics is aligning with core shifts in the way that firms perform to change the landscape of business. The efficient usage of big data has the importance to transform economies, delivering a new productivity growth wave and surplus of the customer. Using big data will become an essential basis of rivalry for organizations and will make new rivalries that are capable of attracting staffs that have core competencies in a world of big data.

Thus, management information systems deal with greater standards of accuracy, compliance and rigor with big data tools of analytics to address unknown data that could influence the strategy of the business and its execution. This study discusses the components that are affecting the successful adoption of big data decision support application, in information management system user organizations.

The organizational factors with regards to the size of the organization and top management assistance had an essential influence on the adoption of BDDSA. This research justifies factors as the key aspect of BDDSA adoption (Pearson and Wegener 2013, pp. 4) have described that to use big data an organization needs three types of table stakes. The first is the data itself with an enormous amount of information in a format permitting for easy analysis and access. The second is advanced tools of the analytic namely open source, proprietary platforms, and devices are available broad these days, and people are using them in their work. The third is the expertise because advanced analytics need staff with state of the art skills from data science of global privacy laws along with an understanding of business and similar value sources. Similarly, it has been mentioned in the paper (Raichel, T. P., Kokila, S. and Sowmya, 2014, pp. 140) that organizations are entering into the big data world must need to balance the needs of business related to big data, with the related costs of entering into and remaining employed in big data processing, capture, analysis, and storage. Any organization which carries out a big data initiative will need to either hire new people or

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retrain existing people for their effort to be successful. (Morabito, V., 2015, pp. 65-80) has impacted another resource by big data as the capital that is the business venture financing. Big data and social media have enhanced the merging of financial and sales through crowdfunding. According to (Ziora, L., and Chluski, 2015, pp 9-18), a key success factor for organizations is the feasibility of similar data at the right time. Businesses required knowing what decisions must be made, how these decisions will influence on operational performance, financial outcomes and when to take action. The request for this kind of insight enhances the development of big data to improve them to make smarter, better; data drove real-time decisions that will modify the way they manage their operations and compete in the marketplace.

According to (Bourgeois, 2014, pp. 39) information system is the study of complementary software and hardware networks that organizations and people use to gather, process, create, filter and distribute data. (Laudon and Laudon, 2006, pp.173-181) have described that information systems comprise of data about essential places, people and things within the firm or in surroundings enclosing it. By information, data have been shaped into a form that is useful and meaningful to human beings. Data are fact raw streams indicating incidents existing in firms or physical surroundings before they have been arranged and organized into a form which people can use and understand.

Information systems have been most useful to managers by offering assistance for their norms in disseminating information, providing liaisons between levels of the organization and allocating resources. However, some rules of managers cannot be assisted by computer systems and are less successful in helping unstructured decisions. (Singh, 2000, pp. 140) refers IT as the science, engineering and technology disciplines and the techniques of management used in processing and handling their computers, application and their communication with machines and men and related social, cultural and economic matters.

1.1. Justification for the research

This study examines the factors influencing the adoption of BDDSA and it creates models that are useful in analysing these variables. The adoption model reveals the relationship between the passage of BDDSA and conceptual framework factors. The BDDSA adoption model is helpful in representative factors influencing BDDSA and in differentiating Nigerian firms as early and non-early adopters of BDDSA. This study proposed technological innovation, environment and organizational factors that were critical for adoption stages. The regulatory factors with regards to the size of the organization and top management assistance had an essential influence on the passage of BDDSA. This research justifies factors as the key aspect of BDDSA adoption.

This research is constrained to Oracle companies, and it is conducted in Nigeria only. The questionnaire study system was utilized in this study by applying the aftereffects of a preparatory study using meetings to gather information from the ORACLE Nigerian clients, and writing in the admiration of advancement adoption. The objective of the study is to build up a theoretical model for the Constructive selection of BDDSA. The extent of the survey is to examine the variables influencing the effective adoption of BDDSA in Nigerian MIS user organizations, and all organizational sectors other than oracle companies forms the scope of the study.

2. MATERIALS AND METHODS

The study deals with the identification of the variables influencing the successful adoption of the BDDSA (big data and decision support applications) in Nigerian MIS (information management system) user organizations by the theory of innovation and to add to a conceptual model for the effective adoption of BDDSA. The study first conducted a preliminary survey to make the questionnaire more active and to check whether it is matching the criteria of the review. The initial investigation is carried out using interviews with the ORACLE of Nigeria and from the literature review information gathered on the innovation theories. The collected data through the interview are analyzed using the text evaluation method, and after the complete analysis, the researcher decided on the questionnaire for the final primary data collection.

The sample size for the study is the management information systems (MIS) customers of ORACLE companies in Nigeria, and sample size for the study are 400 MIS clients of ORACLE firms of Nigeria. The sample selection is based on the users of the MIS and BDDSA applications. The respondents are

chosen based on these criteria since they answer the question with basic knowledge about the study, and it will be efficient, and the project will be a productive one.

The questionnaire contains three parts where the first part comprises of the background information of the respondents. The second part is the "factors affecting the adoption of BDDSA" that contains the questions that were related to the factors that influence the firms from the adoption of the BDDSA applications. The section consists of nine questions, which is of Likert scale types. The author had chosen seven Likert scale type. The next and the final part is the information system knowledge element that has three questions.

The scoring method is used to motivate the reliable scoring of the methods. A 7-point scale for the overall impact of the study does the scoring. The pilot survey is conducted with the managers of the ORACLE firms of Nigeria to know the exact and effectiveness of the questionnaires. The population size of the pilot study is the ten directors of the companies. Interviews were conducted with the directors, and the discussion was useful for the researcher to tune the questionnaire for the final data collection.

For a review design in light of a basic random sample, the sample size required can be computed by the accompanying formula:

$$\mathbf{n = t2 * p (1-p)/ m2}$$

n = required sample size
t = confidence level at 95% (standard value)
p = estimated prevalence
m = margin of error of 5% (standard value of 0.05)

The proper sample measure for a populace based study is resolved mainly by three elements:

1. The assessed commonness of the variable of Interest
2. The sought level of certainty and
3. The acceptable margin of error (Alagbe, E. E., Susu, A. A. and Dosunmu, 2016, pp. 21).

3. RESULTS

From the Pearson correlation test for the hypothesis 1, it can be observed that the value of the Pearson correlation coefficient is 29.067, and its corresponding p-value is 0.000<0.05 ensuring that Perceived benefits of using BDDSA affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria. For the hypothesis 2, it is observed that the value of the Pearson correlation coefficient is 31.523 and its corresponding p-value is 0.000<0.05 inferring that Complexity of using BDDSA affects the successful adoption of Oracle BDDSA by MIS customers of Nigeria. For the hypothesis 3, it is observed that the value of the Pearson correlation coefficient is 31.489, and its corresponding p-value is 0.000<0.05 inferring that, Compatibility of using BDDSA affects the successful adoption of Oracle BDDSA by MIS customers of Nigeria. For the hypothesis 4, it can be observed that the value of the Pearson correlation coefficient is 30.420, and its corresponding p-value is 0.000<0.05 ensuring that Top management support in using BDDSA affects the successful adoption of Oracle BDDSA by MIS customers of Nigeria. For the hypothesis 5, it can be observed that the value of the Pearson correlation coefficient is 29.627 and its corresponding p-value is 0.000<0.05 ensuring that the Employment Size of using BDDSA affects the successful adoption of Oracle BDDSA by MIS customers of Nigeria. For the hypothesis 6, it can be observed that the value of the Pearson correlation coefficient is 31.394 and its corresponding p-value is 0.000<0.05 ensuring that Internal need of using BDDSA in the organization affects the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

For the hypothesis 7, it can be observed that the value of the Pearson correlation coefficient is 33.386 and its corresponding p-value is 0.000<0.05 inferring that Selection of vendors who use BDDSA affects the successful adoption of Oracle BDDSA by MIS customers of Nigeria. For the hypothesis 8, it can be observed that the value of the Pearson correlation coefficient is 31.317, and its corresponding p-value is 0.000<0.05 inferring that the business Size (resources) of using BDDSA affects the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Table 1. One-sample Test

	Test value = 4					
	t	df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Perceived benefits of using BDDSA	29.067	399	.000	1.34687	1.2558	1.4380
The complexity of using BDDSA	31.523	399	.000	1.29050	1.2100	1.3710
Compatibility of using BDDSA	31.489	339	.000	1.27850	1.1987	1.3583
Top management support of using BDDSA	30.420	399	.000	1.25100	1.1702	1.3318
Employment Size of using BDDSA	29.627	399	.000	1.24300	1.1605	1.3255
Internal need of using BDDSA	31.394	399	.000	1.29100	1.2102	1.3718
Selection of vendors using BDDSA	33.386	399	.000	1.32250	1.2446	1.4004
Business Size (resources) of using BDDSA	31.317	399	.000	1.30400	1.2221	1.3859

3.1. Perceived Benefits of using BDDSA

Null Hypothesis: Perceived benefits of using BDDSA don not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: Perceived benefits of using BDDSA affect the successful adoption of Oracle BDDSA by MIS clients in Nigeria. In other to test the hypothesis, a one-sample t-test was applied by using SPSS.

From Table 1 above, we can observe that the t-value for the perceived benefits of using BDDSA was 29.067, and its corresponding p-value is 0.000<0.05 at a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

According to (Jewell, D., Barros, R. D., Diederichs, S., Duijvestijn, L. M., Hammersley, M., Hazra, A., ... and Portilla, I, 2014, pp. 5), BDDSA offers the organizational capability to reshape itself into a contextual enterprise of an organization which adapts to the changing needs of individual customers by using data from a vast number of sources dynamically. The first question asked of the respondents was about if the BDDSA will empower their organization to lessen cost in the operations. From the analysis of the answers obtained it can be observed that a maximum of about 62.8 percent of the respondents agreed that BDDSA would empower their organization to lessen the cost incurred. There were merely a few respondents who disagreed with it.

Next, the respondents were asked if the BDDSA gives competitive data and enhances decision support operations. From the analysis of the answers obtained it can be observed that a maximum of about 58.5 percent of the respondents agreed that BDDSA gives competitive data and enhances decision-support operations, and only about 23 percent of the respondents disagreed with it.

The respondents were then questioned about if their organization accepts that BDDSA will achieve assignments and improve business methods. And it can be observed that about 63 percent of the respondents agreed, and only around 14 per cent of respondents disagreed that, their organization accepts BDDSA will achieve assignments and improve business methods. The next question asked the respondents was about if the BDDSA can screen issues and give solutions in real time. It can be observed from the obtained answers that, about 56.8 percent of the respondents agreed that BDDSA could test problems and provide solutions at real-time and on the other hand nearly 23 percent of the respondents disagreed with the question asked.

3.2. The complexity of using BDDSA

Null Hypothesis: Complexity of using BDDSA does not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: Complexity of

using BDDSA affects the successful adoption of Oracle BDDSA by MIS clients of Nigeria. In other to test the hypothesis, a one-sample t-test was applied by using SPSS.

From Table 1, we can observe that the t-value for the complexity of using BDDSA was 31.523, and its corresponding p-value is 0.000<0.05 for a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

The respondents were then asked about if the procedure of creating BDDSA is confused. From the analysis of obtaining answers, it can be observed that about 64.5 percent of the respondents agreed that the method of creating (making) BDDSA is confused. And around 16 percent of the respondents disagreed that the process of establishing (making) BDDSA is confused. The next question asked the respondents was if the operation of BDDSA is extremely entangled to actualize and use inside their firm. From the answers obtained from the respondents, it can be observed that a maximum of about 58.8 percent of the interviewees agreed that the operation of BDDSA is extensive to be entangled to actualize and use inside your organization. And on the other hand, only around 22 percent of the respondents disagreed with it.

Next, the respondents were asked about if it's hard to learn BDDSA. On analysing the obtained answers, it can be observed that about 59.5 percent of the interviewees agreed that BDDSA 's hard to learn and that only around 15 percent of respondents disagreed with the question.

The next question asked the respondents was if incorporating BDDSA into current work practices will be troublesome. And it can be observed that a maximum of about 58.8 percent of the interviewees agreed that incorporating BDDSA into current work practices will be troublesome while others around 23 per cent of respondents disagreed with it. Next, the respondents were asked about; if there exist significant safety measures inside the firm to execution and utilization of BDDSA. From the obtained answers, it can be observed that about 64.3 percent of the respondents agreed that significant safety exists inside the firm to execution and utilization of BDDSA. And respondents only around 15 per cent disagreed with it. Even though there exist, such complexities, as stated by (Taplin, 2013, pp. 148), the abilities which the BDDSA beings are modifying the way which organizations perform.

3.3. Compatibility of using BDDSA

Null Hypothesis: Compatibility of using BDDSA does not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: Compatibility of using BDDSA affects the successful adoption of Oracle BDDSA by MIS clients of Nigeria. In other to test the hypothesis, a one-sample t-test was applied by using SPSS.

From the table 1, we can observe that the t value for compatibility of using BDDSA was 31.489, and its corresponding p-value is 0.000<0.05 at a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

The respondents were then asked about the compatibility of using BDDSA, and they were first questioned about if utilizing the BDDSA fits well with how the organization functions. It can be observed that a maximum of about 59.5 percent of the respondents agreed that Utilizing BDDSA fits well with how the body works. It can also be noted that only around 21 percent of respondents disagreed. Next, the respondents were asked about if utilizing the BDDSA is predictable for a good organizational quality and convictions. From the answers obtained as responses, it can be observed that about 59.8 percent of the respondents agreed that utilizing BDDSA is predictable their proper organization's quality and convictions. On the other hand, about 24 percent of the interviewees disagreed with the question asked. It is also claimed by (Decker, H., Lhotská, L., Link, S., Spies, M. and Wagner, R. R, 2014, pp. 180-181) that, successful handling of big data and utilizing them for business analytics and decision making involve the development of overall efficiency, the development of accuracy. And the speed of decision making, the capability to forecast, a greater understanding of customers and citizen's requirements and identification of business opportunities.

The respondents were then asked about if the BDDSA is perfect with the firm's infrastructure. On analyzing the answers obtained from the respondents, it can be observed that a maximum about 58 percent of the respondents agreed and about 24 percent of the respondents disagreed that, BDDSA is perfect with the firm's IT infrastructure. Next, the respondents were questioned, if the progressions presented by the BDDSA are complete with existing operating practices. The analysis infers that about 63.5 percent of the respon-

dents agreed, and only about 16 percent of the respondents disagreed that, the progressions presented by BDDSA are perfect with existing operating practices. Next, the respondents were questioned about if the organization in the middle of BDDSA and information assets in the original computer is vital. It can be observed from the obtained answers that about 64.3 per cent of the respondents agreed that the organization in the middle of BDDSA and information assets in the original computer is vital. And only around 15 percent of respondents disagreed with it.

3.4. Top Management Support by using BDDSA

Null Hypothesis: Top management support in using BDDSA does not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: Top management support in using BDDSA affects the successful adoption of Oracle BDDSA by MIS clients of Nigeria. In other to test the hypothesis, a one-sample t-test was applied by using SPSS.

From the table 1, we can observe that the t value for top management support of using BDDSA was 30.420, and its corresponding p-value is 0.000<0.05 at a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

The respondents were then asked about the top management support for using BDDSA and they were first questioned if their top management underpins the appropriation of BDDSA. One of the variables positively affecting usage of BDDSA is the top management support. From the obtained answers it can be observed that about 57.8 percent of the respondents agreed and about 23 percent of the respondents disagreed that, the top management underpins the appropriation of BDDSA. Next, the respondents were asked by the senior officials has offered related assets for the advancement of BDDSA. And it can be observed that about 58.5 percent of the interviewees agreed that senior management had provided related resources for the progression of BDDSA. And on the other hand, it can be observed that nearly 24 percent of the respondents disagreed with it.

The next question asked the respondents was if the top management is mindful of the profits of BDDSA and it can be observed that about 58.5 percent of the respondents agreed, and only about 22 percent of the respondents disagreed with it. Next, they were asked if the top management gives the collaboration to finish for BDDSA projects. And from the obtained answers it can be observed that about 63.5 percent of the respondents agreed, and only around 16 percent of the respondents disagreed that the top management gives the collaboration to finish for BDDSA projects. The next question was, it's the senior management perceives and comprehends information of BDDSA to sway clients effectively to utilize BDDSA. And it can be observed that about 61 percent of the respondents agreed, and only around 23 percent of respondents disagreed with it.

3.5. Employment Size of using BDDSA

Null Hypothesis: The number of resources employed in using BDDSA does not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: The amount of resources used in using BDDSA affects the successful adoption of Oracle BDDSA by MIS clients of Nigeria. In other to test the hypothesis, a one-sample t-test was applied by using SPSS.

From Table 1, we can observe that the t value for business size (resources) was 29.627, and its corresponding p-value is 0.000<0.05 at a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

Next, the respondents were asked about if the measure of the organization has a real effect on BDDSA adoption. It can be observed that about 60.5 percent of the respondents agreed, and only about 21 per cent of them disagreed with it. The next question was if their firm has the technological assets to receive BDDSA. And it can be observed that about 57.3 percent of the respondents agreed and about 23 percent disagreed that the enterprise has the technical assets to acquire BDDSA. The next question was if their business gives financial assets to receive or adopt BDDSA. And it can be observed that about 64.5 percent of the respondents agreed only about 15 percent disagreed with it. The next question was if, other organizational assets like training, IS support, IT Administration aides to develop more elevated amounts of BDDSA adoption. And it can be observed that about 57.7 percent of the respondents agreed, and only about 22 percent disagreed with it.

Next, the respondents were asked if, there are no troubles in discovering all es-

sential to actualize BDDSA. And it can be observed that about 58.5 percent of the respondents agreed, and only around 24 percent disagreed with it. Next, the respondents were asked about, if the key clients of BDDSA are acquainted with, have a vision, and comprehend what BDDSA can accomplish for the organization and if they need a far-reaching preparing to create skills and comprehension and use BDDSA. For these questions, it can be observed that about 58.3 per cent and 66.5 per cent of the respondents agreed respectively. When asked if they are educated in exploiting BDDSA capacities, about 58.8 percent of the interviewees agreed to it. Next, the respondents were asked if there are scarcely any real knowledge boundaries in utilizing BDDSA and about 57.5 percent of the respondents agreed to it. Next, they were asked if there is a satisfactory level of understanding and specialized modernity on the BDDSA clients and it can be observed that about 57.0 percent of the respondents agreed to it.

3.6. Internal Need by using BDDSA

Null Hypothesis: Internal need of the organization does not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: Internal need of the organization affects the successful adoption of Oracle BDDSA by MIS clients of Nigeria. In other to test the hypothesis, a one-sample t-test was applied by using SPSS.

From Table 1, we can observe that the t value for internal needs of using BDDSA was 31.394, and its corresponding p-value is 0.000<0.05 at a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

Next, the respondents were asked if the BDDSA is expected to enhance an appropriate reacting time and to give correct data. From the obtained answers, it can be observed that about 66.3 percent and about 59.3 percent of the respondents respectively agreed to these questions. When asked about if the BDDSA can help in raising competitive changes, it can be observed that about 73.5 percent of the respondents agreed to it. Next, the respondents were asked if the needs manage quality is essential for BDDSA and if there are needs to have expense lessening are obliged to utilize BDDSA. The answers obtained infer that about 51.5 percent and about 59 percent of the respondents respectively agreed to these questions.

3.7. Selection of Vendors of using BDDSA

Null Hypothesis: Selection of vendors who use BDDSA does not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: Selection of vendors who use BDDSA affects the successful adoption of Oracle BDDSA by MIS clients of Nigeria. In other to test the hypothesis, a one-sample t-test was applied by using SPSS.

From Table 1, we can observe that the t value for selection of vendors of using BDDSA was 33.386, and its corresponding p-value is 0.000<0.05 at a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

The respondents were then questioned about, if the level of rivalry in modern industrial spots weights on the firm to embrace this IT and if it is vital to utilize BDDSA in the industrial environment. From the answers obtained, it can be observed that about 61.5 percent and about 60.3 percent of the respondents respectively agreed to this. Next, they were asked if the firm needs to use BDDSA to keep up its intensity in the business market and for this question, it can be observed that about 63.5% of the respondents agreed. Next, they were asked if it is an essential need to utilize BDDSA and if it is a comprehensiveness of innovation. From the obtained answers, it can be observed that about 68.3 percent and about 56.5 percent of the respondents respectively agreed also to these questions.

3.8. Business Size (resources) of using BDDSA

Null Hypothesis: Size of the business does not affect the successful adoption of Oracle BDDSA by MIS customers of Nigeria.

Alternative Hypothesis: Size of the firm affects the successful adoption of Oracle BDDSA by MIS clients of Nigeria. İn order to test the hypothesis, a one-sample t-test was applied by using SPSS.

From Table 1, we can observe that the t value for business size (resources) of using BDDSA was 31.317, and its corresponding p-value is 0.000<0.05 at a cut-off level of 4. Hence we can reject the null hypothesis and accept the alternate hypothesis.

Next, the respondents were asked if the seller's reputation is critical in selecting BDDSA accomplice and it can be observed that about 64 percent of the respondents agreed yes it is. The next question was if the relationship

with clients; compelling experience and capacity to plan, arrange and complete projects are vital, and it can be observed that about 57 per cent; 68.5 per cent and about 60.3 percent of the respondents respectively agreed that they are essential. Next, the respondents were asked if the innovative competency of advisers or consultants is critical or not and it can be observed that about 64 percent of the respondents agreed that it is indispensable.

4. DISCUSSION

The firms are observed to provide with measures and resources like technological assets, financial assets, training, IS support, IT administration etc. to adopt Big Data Application.

The Big Data Application also enhances a timely reacting time and gives the correct data on managing the quality. And the level of rivalry in modern industrial spots weights on the firm to embrace this IT and makes vital to utilize Big Data Application, in order to keep up its intensity in the business market.

Thus, it can be concluded that, the perceived benefits, Complexity, Compatibility, Top management support, number of resources employed, Absorptive capacity of the clients, Internal need of the organization, Selection of vendors who use Big Data Application, the Size of the business, of the knowledge towards using various levels of Big Data Application and Enhancement of the knowledge on understanding Big Data Application, pave way for the successful Selections of Big Data Application with specific reference to organization DSS user organizations.

This study additionally centered around three particular points and the accompanying four questions were formulated as an aide for the Exploration outline to accomplish its point.

1. First, how do the organizational characteristics vary in the degree of Selections and implementation of Big Data Application by organization companies?

2. Next, what are the advancement factors that can impact DSS clients to adopt business intelligence technologies? In the event that there is a distinction, what sort of variables could be proposed distinctively between early Selections and non-early Selections?

3. Then, which factors are the most vital in the advancing/hindering of Big Data Application?

4. Finally, does this proposed model adequately describe previously successful Selections of Big Data Application?

What's more, would it be able to be utilized to anticipate the future selection of Big Data Application as Big Data Application is a moderately recent technological innovation in building up the research model for the Selections of Big Data Application from a DSS viewpoint and incorporated those variables influencing the utilization of IT in organizations. This hypothetical philosophy was gotten from the organizational innovation and BI.

5. CONCLUSION

The study also infers that the top management of the organization is mindful of the profits of BDDSA and that they highly support it, by offering related assets for its advancement and by underpinning its appropriation. The top management is also observed perceive and comprehend information of BDDSA to sway clients effectively to utilize BDDSA and also gives the collaboration to finish for BDDSA projects. It can thus be concluded that, only with the support of top management, the complete support of BDDSA can be obtained. The firms are also observed to provide with measures and resources like technological assets, financial assets, training, IS support, IT Administration, etc. to adopt BDDSA.

Given the developmental significance of the utilization of the insight business procedures as a decision support tool in organizations, it is shocking that the factors that impact the adoption of BDDSA have not been entirely explored. Under these circumstances, the general point of this study was to investigate and examine variables influencing the adoption of BDDSA from MIS viewpoint utilizing these advanced technology and decision support tools.

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Conflict of interests

Author declare no conflict of interest.

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GEOGRAPHY AND ENVIRONMENT – ANALYSIS OF INDICATORS OF SUSTAINABLE DEVELOPMENT OF TOURISM

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ABSTRACT

National parks as the most complex category of protected resources are provided for the overall sustainable development, and coordination of geography, tourism and nature conservation is a basic development orientation of these areas in the future. In order to analyze the state of environment, but also the impact of tourism on nature, the method of indicators of sustainable development of tourism of the World Tourism Organization (UNWTO) is applied in the paper in the case of the National Park Tara (Western Serbia). The study included analysis and evaluation of indicators related to the ecological value of the area and direct impact of tourism activity on the protection of nature.

1. INTRODUCTION

Many researchers have suggested that the relationship between geography, tourism and protection is dynamic and complex (Sharpley, 2009; Williams, Ponsford, 2009; Nyaupane, Poudel, 2011; Briassoulis, Van der Straaten, 2013; Holden, 2016). Eagles and McCool, 2002 (according to Brankov, 2010) argued that tourism is a fundamental element that determines whether society has awareness and sufficient level of understanding to preserve a certain area. If we take into account the fact that recreational tourism is one of the most massive form of tourism and that recreational needs of visitors are most fully resolved in the best preserved natural areas, then the role of protected natural resources in tourist developments is clear. Here the emphasis is particularly placed on the national parks as the most complex category of protected resources. By their protected status, these areas are provided for the overall sustainable development, and the question of realization is set as a priority in the sphere of managing these facilities. The links between tourism and sustainability are complex. At large scale, prosperity increases environmental impact. At smaller, local scale, in developing nations, tourism wealth buys fishing boats, chainsaws, livestock, and labor, with costs to conservation and equity (Buck-

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ley, 2012; Lee, 2013; Jamal and Camargo, 2014).

The main objective of nature protection in national parks is to provide permanent protection and preservation of the complex ecosystems and landscapes, as well as rare species, attractive sites and natural phenomena. Since such protected natural areas attract great interest of visitors, the question of harmonizing the interests of tourism and nature conservation arises. Different authors (Jovičić, 1997; Nikolić, 1998; Eagles, McCool, 2002; Stojanović, 2005; Bushell, Eagles, 2007; Novelli, Scarth, 2007; Žujović, Brankov, 2008; Brankov, 2010; Bjeljac et al., 2012; Srdanović, Pavić, 2015) wrote about initial conditionality of tourism and the resources, which are placed under the protection (in particular the national parks). Researchers agreed that the protective function is the basic function of each of the national parks, because their formation is based on the idea of preserving original value of nature. Also, less degraded nature may be more attractive for tourist visits. Therefore, national parks provide exceptional possibility of tourism activation (Brankov et al., 2015), and their tourism function cannot be ignored in the implementation of sustainable management (Lozano-Oyola et al., 2012; Torres-Delgado and López Palomeque, 2014; Bramwell, 2015).

Serbia declared five national parks, which are partly or fully accessible for tourist visits, with the exception of sites for specific purposes, with the limits regulated by protection zones. National parks are managed by separate public companies, in accordance with the *Law on National Parks*. The subject of this research is to analyze the relationship tourism – nature protection in the National Park Tara, through the interpretation of the indicators of sustainable tourism development.

1.1. Research geographical area

The National Park Tara covers most of the mountainous Tara region in the far west of Serbia, on the border with Bosnia and Herzegovina (Republic of Srpska). Tara is linked by the Drina valley from the north and west, the Rzav valley from the southwest, and by the Kremna valley from the south that separates it from the Zlatibor plateau. Mountain space is a unique geographic unit, about 45 km long and up to 18 km wide in the central part of the mountain and the average altitude of 1 200 m (Figure 1).

Figure 1. Map and position of the National Park Tara in Western Serbia

The NP Tara was declared in 1981. It covers an area of the municipality of Bajina Bašta, and its special value is the canyon of the Drina River, built of limestone rocks up to 1000 m high. The most spacious and most attractive part of the mountain is the Ravna Tara plateau (Nikolić, 2006).

The complex structure of relief, a variety of geological ground and specific climatic characteristics led to large biogeographic richness and diversity. Unique natural conditions and isolated position of the mountain enabled the development and survival of diverse flora and fauna, with significant participation of endemics and relics. Forest ecosystems are one of the basic phenomena of the NP Tara, which cover more than 75% of the total area of the mountain.

2. MATERIALS AND METHODS

In order to comprehensively analyze the relation tourism – environmental protection, the Method of indicators of sustainable tourism development is applied in the paper, defined by the World Tourism Organization (UNWTO, 2004). Under this approach, the UNWTO developed about 50 problem topics (each with about 10-15 subtopics), classified into 4 categories (economic, social and cultural, environment and management), wherein sets of indicators for tourist destinations are proposed within each problem topic and subtopic. The method has been used with the goal of identifying and measuring the results of human activity within the NP Tara and indicating the possible risks and directions of future actions.

Research was focused on the indicators defined in the problem issue related to the protection of nature and the impact of tour-

ism on the environment. Due to large number of proposed indicators within this topic, their assessment is carried out through the evaluation criteria (relevance, feasibility, credibility, clarity and comparability) and thus those that will participate in the research are isolated. Indicators proposed by the UNWTO are also additionally analyzed according to types of destinations (in particular for national parks and natural and sensitive ecological habitats), as a complement to the methodology. On this basis, the investigation included a total of 6 indicators related to the environmental value of the area: level of protected area, recognitions of international programs, protected, endemic and endangered species, damage to forest ecosystems, as well as a direct impact of tourism activity on the protection of nature: quality of river water, illegal waste disposal sites and systems for purifying and recycling.

3. RESULTS

As noted above, several different indicators have been analyzed in the paper in order to examine the impact of tourism on the environment, as well as the nature conservation issue in the NP Tara. After analysis, we started with their explication and the interpretation of results.

I Level of protected area – since one of the primary principles of nature protection is to ensure stable conditions of preservation of basic natural resources and environmentally rational use under regulated circumstances, protection defines the basic purposes and modes of use of space. If it comes to spatially greater resource, as is the case with national parks, the concept of zoning of territory is applied (Nikolić, 2006). The indicator that is related to different levels of control indicates the existence and the coverage of zones with different degree of protection in national parks, as well as the regulated regime in managing them.

Spatial plan of special purpose of the National Park Tara defines three zones of the area protection. Priorities are established for each mode in terms of activities, protection and sustainable use. Zone of the highest (I degree) protection involves the strict conservation of the most important natural and cultural historical values including 15.40% of the total surface area of the National Park. In this zone, there are 10 nature reserves, as well as certain immovable cultural resources. It is intended for scientific research, education and limited presentations to the public. Zone of the II degree of protection means a lower level of protection, i.e. interim protection of especially valuable natural environment complexes around areas in the 1st degree and has covered 40.20% of the National Park. In this zone, there is a variety of landscape and cultural and historical sites. It involves professional activities aimed at the scientific research, education and presentation. Zone of the III degree represents the lowest level of protection. It includes 44.40% of the NP Tara and involves limited use of natural resources and controlled intervention in the area (agriculture, forestry, tourism development, recreation and sports functions, water management, transport and renewable energy sources in energetics). It contains parts of forest complexes, agricultural areas (1 300 ha), as well as the construction space of tourist centers. A wider protection zone of 37 584 ha was also established around the national park. It is provided for controlled forestry and animal husbandry, tourism, sport and recreation, water management, transport and renewable energy sources in energetics.

II Recognitions of international programs – international recognitions for national parks are an important indicator of their tourist value, as evidenced by the uniqueness and environmental values of a given space. The indicator that relates to recognitions of international programs indicates the acquisition of protected status according to international conventions and programs (such as the Ramsar Convention, the UNESCO Biosphere Reserves, IBAs, etc.). NP Tara gained protected status on the basis of several international conventions and documents (Special Purpose Area Spatial Plan for the NP Tara, 2010, Management Plan for the NP TARA for the period 2012-2021, 2011), owing to which it is declared for:

- *Internationally important areas for birds* – IBA (Important Bird Areas), for rare and endangered species of birds and large diversity of ornithofauna. The area is established by the program »Birdlife International« and covers the wider environment of Tara mountain with 135 recorded species (122 species of nesting birds) and about 170 assumed species;
- *Internationally important areas for plants* – IPA (Important Plant Areas), established according to the program »Plant Life International - Plant Europe«, owing to the presence of 1 100 plant species (one third of the flora of Serbia) and a large number of endemic species, relics and endangered species;
- *Selected prime area for butterflies* –

PBA (Prime Butterfly Areas) under the »Butterfly Conservation Europe« with a total of 138 identified species; and

- *Potential »Emerald« areas* – as part of an ecological network in Serbia, consisting of spatial units that have special national and international significance in terms of biodiversity conservation.

The NP Tara has also been recognized by the UNESCO. This natural area, along with the Landscape of Outstanding Features Zaovine and Nature Park Šargan - Mokra Gora, was nominated for transboundary biosphere reserve by UNESCO within the program »Man and Biosphere«.

III Protected, endemic and endangered species – when it comes to the protection of natural resources and the possible impact of tourism on the environment, the presence of rare, endangered and extinct species in the area of the studied protected resources is a very important indicator. These species are generally protected by law and testify about the specifics of the area from the perspective of living conditions, so they further increase the attractiveness of the national park. On the territory of NP Tara there is many rare and endangered species, endemic or relict character, which are protected by law and testify about the diversity of living conditions in the area.

Diverse flora is one of the fundamental values of the NP Tara. The mountain is known as refuge area in which the relict plant species of warm and humid tertiary period survived. Over 1 100 plant species grow in wider area of the NP Tara, representing almost a third of the total flora in Serbia. In this area 210 species of plants are protected, of which 47 are strictly protected. By *Regulation on Protection of Natural Rarities* (Official Gazette of RS no. 50/93, 1993) in NP Tara, 21 plant species are protected as natural rarity of great importance. All protected species are subject to the prohibitions of picking, collecting, cutting or uprooting, endangerment and habitat destruction. Among endangered natural rarities, which were put under protection, the following stand out: Serbian spruce (*Picea omorika Pancic*), Heldreich's maple (*Acer heldreichi Orph.*), Yew (*Taxus bacata*), Broad buckler-fern (*Dryopteris dilatata*), etc.

Presence of a large number of endemics, species with limited natural distribution, is characteristic for the wider area of NP Tara. Previous research revealed the presence of 30 endemic species. The most famous and the most prominent feature of endemic flora of the mountain Tara is a unique species - Serbian spruce (*Picea omorica Pancic*), relict and endemic species of conifers and »living fossil« of European and Balkan flora. It is protected from cutting and has the status of protected natural rarity. The Serbian spruce largest population in Serbia is located within the National Park Tara. Spruce inhabits shallow, skeletal, humusrich soil, at altitudes of 700-1 600 m. It occurs in different communities, mostly of mixed character, with spruce, fir, beech, white and black pine, etc. Having a continuous character, areal parts of Serbian spruce on the mountain Tara are identified and protected as a strict nature reserve, and the points with individual trees or groups of trees are protected as nature monuments. A total of 22 localities with the presence of Serbian spruce are identified on the mountain Tara.

Apart from large biodiversity of flora, numerous habitats of fauna can also be found in a wider area of NP Tara. This region recorded nearly half of all mammal species of Serbia (53 species). More than half of these species are protected by law as natural rarities: Alpine shrew (*Sorex alpinus*), Natterer's bat (*Myotis nattereri*), Liechtenstein's pine vole (*Microtus liechtensteini*), European otter (*Lutra lutra*), Brown bear (*Ursus arctos*), etc. It is assumed that 12 bat species living on Tara have not been explored in detail (Management Plan for the NP Tara for the period 2012-2021, 2011).

In this region 135 bird species (122 nesting birds) are identified, but it is estimated that their actual diversity is more than 170 species, and thus Tara is classified as internationally important area for the conservation of birds of Europe (IBA). National laws strictly protected about 100 species, while some are also on the list of species of European importance: Corncrake (*Crex crex*), Western capercaillie (*Tetrao urogallus*) and Eurasian threetoed woodpecker (*Picoides trydactilus*). The rare and endangered species of birds of prey are of special value are Golden eagle (*Aquila chrysaetos*), Peregrine falcon (*Falco peregrinus*), Shorttoed snake eagle (*Circaetus gallicus*) and Northern goshawk (*Accipiter gentiles*) (Management Plan for the NP Tara for the period 2012-2021, 2011).

Examinations of wider area of Tara revealed 13 amphibian species and 12 reptile species. At the national level 9 species are protected as natural rarities of great importance and 3 species are protected at the European level (e.g. Great crested newt, European pond turtle and Yellow-bellied toad). There are 19 fish species in the aquatic habitats of the Park. The salmonid species typical of alpine aquatic

ecosystems are of special value. It is assumed that there are about 4 000 insect species on Tara. Significant is the large number of daily butterfly species (138 species), due to which this area has been a selected area for daily butterflies in Serbia (PBA) since 2003.

IV Damage to forest ecosystems – as national parks, among other things, are founded on the basis of general and specific values of the dominant forest areas, an indicator of damage to forest communities is of great importance when it comes to the environmental dimension of tourism. If in addition the protective function of forests is considered, as well as the aesthetic component that contributes to the attractiveness of the area, it is clear that the state of forest ecosystems can greatly influence the choice of tourist destination. In this connection, the indicator indicates the presence of damaged forest ecosystems within protected area, as well as assets invested for their rehabilitation on an annual basis.

The NP Tara is dominated by forest ecosystems in 78.8% of protected area, and by preservation and diversity of forest ecosystems it is one of the richest and most valuable forest areas of Europe. The main causes of damage to forest ecosystems and deterioration of the health status of forests in this area are as follows: drying of forests, pests of entomological and phytopathological origin, breaking and rooting out (Figure 2).

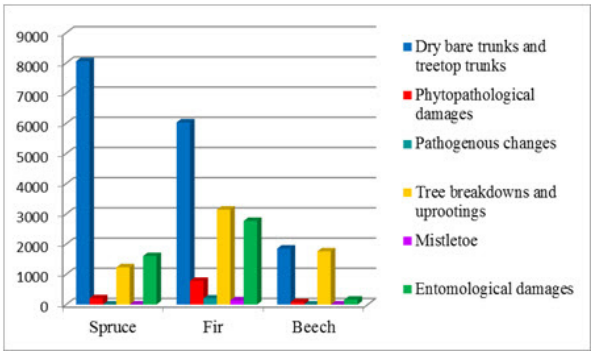

Figure 2. Types of forest trees damage in the NP Tara (in m^3) (Adapted from the Report on the Monitoring of Forest Drying in the area of NP Tara, 2014)

On the territory of NP Tara intense drying was noted in nearly all forest ecosystems, wherein trees on shallow and skeletal soil were most threatened. The biggest impact of drought was registered on spruce and fir trees that significantly became physiologically weak due to shallow root system. In 2013, the management carried out sanitary felling, removing about 25% of the annual increment of these two species within the regimes of II and III protection zones. Drying also affected beech trees, while all three types were registered significant damage due to breaking and uprooting. Low power of renewal and the lack of competitiveness in relation to other woody species also caused drying of several dozen Serbian spruce trees in different habitats (www.nptara.rs).

Drying resulted in an increase of pests of entomological origin (bark beetle), which contributed to the further deterioration of the health condition of forest ecosystems. Given that this insect attacks weakened trees first, drying of forests has affected its growth, which caused that healthy trees have also become endangered. In 2014, in order to reduce the population size of this insect to acceptable one, Public Company »National Park Tara« set up pheromone traps, which had greater efficiency in the spruce forests and a small effect in the fir forests (Report on the Monitoring of Forest Drying in the Area of NP Tara in 2014, 2014).

Forest fires are one of the causes of damage to forest ecosystems in NP Tara. A wider area of the park was affected by a large fire in 2012, and the consequences are felt to this day. The fire broke out on the southern slopes of Tara, within the LOF Zaovine and was not directly affecting the protected area of the National Park Tara. Forest ecosystems in the wider territory of the mountain suffered a lot of damage, because about 1 800 ha of beech, fir, pine and spruce forests burnt in a fire that lasted 12 days. Contaminated forests were mostly privately owned, and besides large ecological damage (completely or partially destroyed forest ecosystems with numerous relict and endemic species), there was a substantial damage from the economical point of view, given that the forestry has been the main activity of local population. It is estimated that fire destroyed one third of the forest ecosystems within the NP Tara protection zone, mainly at an altitude of 1 200 meters. In 2014, in order to remediate the consequences of this fire, Public Company »National Park Tara« joined the reforestation of vulnerable territory around Lake Zaovine within the protection zone of the National Park (www.nptara.rs).

Given the fact that 80% of all revenues of PC »National Park Tara« derived from the planned forest management, the forestry on Tara is the field in which it is invested most (about 50% of total investments). Since active forestry has a tradition of more than a century, it has been the main protected resource management activity in addition to the protec-

tion and conservation of natural ecosystems. Investments in the recovery of forest ecosystems in 2013 accounted for 17.3% of all investments of the NP Tara (Information on the PC »National Park Tara« for 2013, 2014).

V Quality of river water – as certain tourist activities relate directly to hydrographic objects (swimming, diving, recreational fishing, cruising, rafting, etc.), the quality of their waters significantly affects the tourist traffic. Hydrographic objects are important part of tourist offer, and the indicator referring to the quality of river water of the main watercourse in this area - the river Drina is taken into consideration.

Data of the Republic Hydro-meteorological Service of Serbia on the water quality of the river Drina in the period 2006-2010 (http://www.hidmet.gov.rs/index_eng.php) were used to analyze this indicator. Survey comprises the river profiles Bajina Bašta and Ljubovija, at which a systematic water quality analysis is carried out (averagely once a month). It is in this case determined on the basis of calculating the pollution index (WPI) (Brankov et al., 2012).

If the entire five-year period is cumulatively analyzed (Table 1), it can be concluded that both analyzed profiles are in the III water quality class. Analysis by years shows that the smallest pollution at the profile Bajina Bašta is recorded in the period 2006-2007 (Class II), but during next three years, water quality progressively deteriorated (Class III and Class IV). When it comes to profile Ljubovija, the Drina has been in the III water quality class during the whole period, with minor variations in the WPI values. The biggest pollution at profile Bajina Bašta was recorded in 2010, when the WPI value was 2.86, while at profile Ljubovija, the largest WPI value was recorded in 2007 (1.70).

Table 1. WPI value in analyzed stations in the period 2006-2010

Station	2006	2007	2008	2009	2010	WPI
Bajina Bašta	0.82	1.00	1.56	2.11	2.86	1.67
	II	II	III	IV	IV	III
Ljubovija	1.22	1.70	1.15	1.10	1.10	1.25
	III	III	III	III	III	III

Analysis of the annual WPI values showed that the Drina River was the cleanest in 2006 and 2007 (Class II and Class III), but later its water quality deteriorated - Class III in 2008 and Class III and Class IV in 2009 and 2010. When it comes to the impact of individual parameters on the degree of pollution of the river Drina, the increasing registered values of saprobic index and coliform germs confirm moderate organic pollution. Certain parameters (pH, nitrites, sulfates, ammonium and suspended sediments) are within the limits of regulated values according to the standards for Class I and do not have a significant effect on pollution. There are also increased levels of orthophosphates, which are in certain periods (2008 and 2009 at profile Bajina Bašta) 18-30 times higher than the regulated standards. Increased number of germs also indicates pollution of municipal waters from households, while the increasing levels of orthophosphate indicate pollution originated from industrial and municipal waste waters, as well as the influence of agricultural production. Pollution of the watercourse is further affected by uncontrolled dumps and large quantities of waste (illegal dumps) on the river banks.

Measured values of heavy metals in the analyzed five-year period were within acceptable limits, so their impact on the pollution of the river water is relatively small. The exception is the increased concentration of Fe at profile Bajina Bašta in 2010, with a value of nearly 40 times higher than the regulated standards for Class I.

Industrial plants have the greatest impact on the Drina river basin pollution. Although a part of the industrial units is closed today or works at minimum capacity, the river is used for pouring waste water from the plants, with the partial processing treatment or without it. Upstream of Bajina Bašta and NP Tara, in the municipalities through which the Drina and its tributaries (primarily the Lim) flow (Foča, Goražde and Višegrad), there are uncontrolled dumps placed directly along the river, whose discharges further pollute the river and from which, with the rise of water levels, trash washes and accumulates in lake Perućac. Pollution is also affected by Ćehotina tributary, which is polluted by the tailings of a former lead and zinc mine »Šuplja stijena« near Pljevlja in Montenegro.

The causes of pollution affect the Drina to get to NP Tara contaminated to some extent by organic and inorganic pollutants, which negatively affects the possibility of its tourist use. However, obtained WPI values have confirmed that until 2008 the river in the area that includes the NP and downstream of it has been in the categories II and III, which are characterized by clean or moderately polluted water, while the major contamination is pres-

ent in the last two analyzed years (Class IV at profile Bajina Bašta). Since the Drina water is used for recreational purposes and bathing, it is important to note that the values of the elements that contribute most to the increase in pollution during the last two years are within the limits allowed for this kind of use of river waters. This means that despite the registered trend of deterioration of water quality of the Drina River, its tourist function has not still been violated, although this could happen in the future, if the pollution trend continued.

VI Illegal waste disposal sites and systems for purifying and recycling – in the context of this indicator, the presence and distribution of illegal waste disposal in the area of the NP Tara have been considered, as well as the existence of a system for purification of waste water and the recycling of waste inside the tourist facilities. Waste management is one of the key issues of tourism development. Tourist activity is often compromised by pollution of its core values - beaches, rivers or lakes. Pollution, whether it originates from the tourist facilities or the local community and industrial capacities, can degrade the site and contribute to the spread of disease and damage natural resources.

In the wider area of the NP Tara there is a problem of insufficiently developed and regulated public utilities. General infrastructure, inadequate for tourism development and the lack of system for recycling waste are indicated as the main weaknesses of analyzed area in the *Tourism Master Plan of the Mountain Tara and its Environment*. This problem was also pointed out in the *Spatial Plan for the Area of Special Purpose NP Tara*. Although the document points out that landfill is not allowed officially in the National Park, as well as within its protection zone, in some localities, however, there are illegal landfills and dumps.

This applies in particular to the growing cottage settlements (Kaludjerske bare, Sokolina, Mitrovac, Osluša, Krnja jela, Račanska šljivovica, Oštra stena, etc.), which are spreading uncontrollably, often without the necessary infrastructure. Although during the last decade the owners of houses are given the opportunity to legalize their facilities, the problem of illegal construction is still present on Tara, often accompanied by the occurrence of illegal dumps due to the unsystematic infrastructure. This is especially expressed on the banks of Lake Perućac, near the nature reserve »Derventa River Gorge«, where in 2012 there were more than 100 illegally constructed buildings. Although Public Company »National Park Tara« set containers for waste collection in the weekend zones, illegal waste disposal sites are not completely removed. One of the main reasons for this phenomenon is underdeveloped awareness of the population in weekend zones about the ways of behavior that threaten the environment and collide over the stated environmental principles. It is difficult to sanction such behavior due to the problem of identifying the pollutant. Public Company NP Tara organizes cleaning actions of these landfills, where, in addition to employees, members of non-governmental organizations, environmental associations and the local population also participate.

One of the long-standing problems in the wider area of NP Tara is a surface waste in the Drina canyon and the so-called 'floating landfills' that are formed on Lake Perućac. Due to presence of different pollutants in the upper course of the Drina River and its tributaries, on the territory of Montenegro, Bosnia and Herzegovina and Serbia, Lake Perućac and the zone of NP Tara are contaminated with several dozen m^3 of floating waste per year. Besides the negative environmental consequences, there are other significant problems - failure of HPP »Bajina Bašta« in 2010 due to the accumulation of waste. Vulnerability of the lake is the highest in early spring, when the water level of the river is the highest due to rainfall and snow melting. Each year municipality of Bajina Bašta organize cleaning of waste from the lake in cooperation with the local population, but a permanent solution has not been found. A possible guideline that is imposed is the interstate agreement between Serbia, Montenegro and Bosnia and Herzegovina on joint management of the Drina river basin.

The accommodation and catering facilities on the territory of NP Tara do not have their own systems for wastewater treatment. The exceptions are the hotels in Kaludjerske bare (the Omorika and the Beli bor) in which, starting from 2004 waste water is purified by biodisc purification system. Technological process of work of these devices is based on the presence of microorganisms that process fecal and other wastewater in the II A water quality class (rank of water quality of the river Drina). A small number of facilities in the NP Tara have impermeable septic tanks that are emptied as needed. The Public Company began construction of sewerage network for its own tourist facilities in Mitrovac (visitor's center, lodge, hunting lodge), but it has not been regulated and finished yet.

Travel companies, hotels and restau-

rants in the wider area of NP dispose waste in containers that the households use, and municipal utility companies or managers of the resource protection are responsible for their organized removal. The recycling of these wastes is not made within tourism capacities, however, utilities in Bajina Bašta and Užice have introduced wire containers for separate collection of plastic, which is at a later stage of waste management recycled at the regional landfill.

4. DISCUSSIONS

After analysis of selected indicators, it is necessary to access their understanding and the interpretation of results, in order to focus future actions in the sphere of management of protected areas. This process involves the defining of reference points, i.e. criteria by which to assess the value of certain indicator or threshold values, which identify critical change of indicators.

In this case, determining the socalled 'acceptable range of values' has been carried out, in the range of which it can be spoken about the possible sustainability of the given indicator in the future. If the indicator outside the identified range is in the negative sense, this is a signal for future appropriate actions, which should improve the situation and bring it to a sustainable level. Defining acceptable range is carried out by consulting the results of modern tourist research and projects, based on the use of indicators of sustainable tourism with specified acceptable values for each of them - Samoa Sustainable Tourism Indicator Project (SSITP) and Kangaroo Island Tourism Optimization Management Model (TOMM) (UNWTO 2004). In addition, the value of specific indicators is evaluated on the basis of reference point, for the defining of which a successful practice example was used - Plitvice Lakes National Park in Croatia. By the degree of protection of nature, but also the achieved economic indicators, this protected area set a quality sustainable model of the interaction between tourism and natural features (Ružić, 2011).

Results of the evaluation of indicators are shown in the Table 2. Due to the presence of precisely defined three-stage protection regime in NP Tara, the indicator relating to this issue has been assessed as »good«. Priorities in the field of permitted activities and protection are set up for each regime, and sustainable management is set up as the ultimate goal. Zoning is done in such a way that the environmentally most valuable areas are strictly protected, and the use of space for tourist and other purposes is permitted to a limited extent.

Table 2. Interpretation of indicators of nature conservation and the impact of tourism on environment in NP Tara

Issue theme	Indicator	Interpretation
Nature conservation and impact of tourism on environment	The percentage of the protected area subjected to different levels of control	GOOD
	Recognition of international programs	GOOD
	Protected, endemic and endangered species	GOOD
	Damage to forest ecosystems	BAD
	The quality of river water	ACCEPTABLE
	Illegal waste disposal sites and systems for purifying and recycling	BAD

As the biogeographic characteristics of NP are its core values, the indicator relating to the presence of protected, endemic and relict species is very well rated. Similarly, to the referent NP Plitvice, where the presence of these groups is significant and exceeds 1% of the total biogeographic diversity, in the studied national parks the endemic and relict species are numerous, as well as those that are protected by the national laws and international conventions due to vulnerability. In connection with this indicator is the indicator that relates to the recognition of international conventions and programs, as they are based on the presence of these biogeographic categories.

When it comes to the indicator which is related to the damaged forest ecosystems in the studied NP, the situation is quite different, given the present process of drying of forests (primarily conifers) in Serbia, culminating in the period 2012 - 2013. Unlike the Plitvice Lakes National Park, where extremely small-scale drying was registered during the ten-year period (2003- 2013), in the NP Tara there is an intensive long-term drying in nearly all forest ecosystems. Forests of spruce and fir are the most vulnerable and physiologically

weakened, with about 14 000 m3 of dry trees in 2014. If we add to this the consequences of a fire in 2012, during which the forest ecosystems of the wider territory of the mountain Tara suffered a lot of damage (about 1 800 ha of fir, beech, pine and spruce forests burned), it is clear that the analyzed indicator is not on a sustainable level.

Indicator of the quality of the river water is in an acceptable range, and the obtained WPI values have confirmed the tendency of deterioration of water quality in the Drina River (Class II and Class III to 2008, and then transfer to Class IV). It should be emphasized that its tourist function has not been violated, although this could happen by further pollution. As the river water is used for bathing and recreational purposes, any further deterioration of its quality would damage the living world and sustainable tourism development of the area.

The analysis identified unsustainable state of indicator of the presence of illegal waste disposal sites and systems for purifying / recycling. Illegal landfills and dumps represent a real problem for the studied area, and are usually located along the banks of the rivers and in the weekend settlements. Although they are regularly cleaned and removed, the newly created ones replace them, and the problem of their rehabilitation receives permanent frames. The accommodation and catering facilities in the territory of the studied NP (except the hotels Omorika and Beli bor in Kaludjerske bare) do not have their own systems for treatment of waste waters, which discharge untreated into the city sewers. The hotel facilities and restaurants, as well as all tourism enterprises do not carry out their own recycling of solid waste, which is not in compliance with current environmental standards.

5. CONCLUSIONS

Global analysis of the indicators confirmed that the NP Tara has strong environmental attributes and that tourism in the studied area did not make any significant damage to the environment. Application of indicators has enabled the identification of the results of actions that have been undertaken so far, as well as the upcoming and existing problems, which provides guidance for future management actions in a sustainable direction.

Although in the NP Tara there is a good basis for planning the development of tourism on sustainable bases, it is necessary to find solutions to identified problems and developmental brakes. This refers to the problem of forming illegal waste disposal sites, the permanent solution of which is not in sight. The negative impact of tourism on the environment is also reflected in the fact that the tourist facilities and facilities managing national parks do not have devices for wastewater treatment or to recycle solid waste. In order to put further development of tourism under environmental control, it is necessary to prepare such devices and improve the collection and treatment of solid waste. A good move would be an initiative to form specific points at which waste would be collected and then recycled.

Public company responsible for managing the protected area puts effort to coordinate tourism development with nature protection through the operation in terms of limiting tourist activities and controlled visits to the 1st protection zone sites. This operation should become the main development orientation of the national park, i.e. environmental criteria should not be ignored when trying to establish a sustainable tourism offer. It is emphasized that sustainable tourism is not a static target, which can be reached after a planned number of years, but the process towards the desired future, with the changes that emerge over time. All future actions need to be planned in accordance with this premise.

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Conflict of interests

Authors declare no conflict of interest.

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SOLAR ENERGY APPLICATION IN HOUSES HEATING SYSTEMS IN RUSSIA

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ABSTRACT

The solar energy is widely used around the world for electricity generation and heating systems in municipal services. But its use is complicated in the number of territories with uneven receipts of solar radiation on the earth's surface and large number of cloudy days during a year. A hypothesis on the possibility of application of individual solar collectors for heating of houses in the number of cities of Russia has been tested. The existing designs of solar collectors and checking the possibility of their application in northern territories of Russia are investigated. The analysis was carried out taking into account features of relief and other climatic conditions of the Perm and Sverdlovsk regions. As the result of research, the basic recommended conditions for application of solar batteries in houses of the northern Russian cities have been resumed.

1. INTRODUCTION

It is very important to apply solar energy for a wide variety of applications and provide energy solutions by modifying the energy proportion, improving energy stability, increasing energy sustainability, conversion reduction and hence enhance the system efficiency. The present work aimed to study the application of solar energy systems in house heating.

During the previous research of Mingaleva, Z., and Shpak, N., 2015 it was revealed that in many Russian cities development of solar power production is inexpedient. The modern design of power generation of industrial solar installations is impossible in many regions of Russia because of uneven receipt of solar radiation on the earth's surface within a year, including Perm and Sverdlovsk Regions. In these regions all main restrictions of solar power use are mostly shown, they include the following:

- seasonal distinctions in the day length;
- existence of a large number of cloudy days;
- high snow cover for a long time.

Now approaches to solar energy use in house construction are divided into types: active and passive Mingaleva, Z., and Shpak, N., 2015. The active approaches are based on using the solar energy batteries for production of heating and electrical energy, completely providing all needs of house inhabitants. The passive one is based on special arrangement of houses on districts, use of special designs, etc. The passive use of solar energy is applied generally in the southern regions, where sunlight is at maximum level and it is a constant within a year. In regions of a midland and northern territories, active use of solar energy is applied by solar batteries.

2. MATERIALS AND METHODS

The decision to test the hypothesis of economic feasibility of use of solar batteries for receipt of heat and electrical energy for residential and public buildings was made due to the availability of data on insolation amounts in the main regions of Russia and with breakdown for the summer/winter period. Calculations were carried out for four dates: On March 20, on June 21, on Septem-

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ber 22, on December 21, 2014 in astronomical midday when the maximum eminence of the Sun over the horizon is observed. Sun azimuth size makes 180° at this time. Allocation of key points is made to determine the periods of effective use of solar batteries. For different latitudes astronomical midday falls on average at 13:00 local time.

On the basis of the comparative analysis method, the assessment of opportunities of the Russian cities to develop solar power at apartment houses is carried out. The study comprised the period covering the whole year and not just the key points of change. For calculations the data on solar statistics for 2014 were used. The calculations are made using "planetcalc.ru" system and the solar calculator. The data on the number of sunny days during a year, astronomical midday, angle between the plane and the direction of a stream of the solar energy are retrieved from statistic data during the time between sunrise and sunset. The data on efficiency of power return of the solar installation for apartment houses were used from Girard, A., Gago, E.J., 2015; Chiras, D. 2002; Badescu, V. 2003; Kaygusuz, K., Ayhan, T. 1999. According to this source, the highest coefficient of power return of the solar installation during a year can be achieved in case of its arrangement in the southern direction with an inclination 30° - 35° to a horizontal surface. Calculations of coefficient of power return of solar installation in a year have shown that upon transition of winter months to summer reduction of possible heat constitutes about 1% for every 1° deviation from a angle with the maximum effect. Therefore, for increase in a potential exit of heat during the winter period, especially when using for heating of the room, it is recommended that the collec-tor has been established on angle more than 15° – 20° of the corresponding width. For example, the heating collector installation with slope 30° even at 45° of southwest direction gives nearly 95% of the optimal energy efficiency. Previous research has indicated that in certain situations - in regions with deep snow cover - it is recommended to establish a collector so that it will be not possible for snow to block the front part of the collector. Mathematical calculations of an optimum angle of an inclination of the solar panel are applied to determine the most effective volume of absorption of solar energy by the square of the solar battery by Emanuele Calabrò, 2013. The calculation of an ideal tilt angle for installation is carried out with use of results of the research conducted earlier by Chaturvedi, S. K., Shen, J. Y. 1984; Siraki, A. G.; Pillay, P. 2012. Conclusions on the thermal efficiency of the cooker which have been received by on different conditions are taken from other research of Arabacigil, B., Yuksel N., Avci A. , 2015.

3. RESULTS

The choice of optimum orientation of the solar panels is one of the major questions at any type of the practical solar installation use. In the literature devoted to solar energy, this practical aspect is considered briefly. As it is known, the shading of surface directly influences the reflection coefficient of this surface. In case of solar batteries it determines the volume of the absorbed and reflected solar energy. For example, empirically for the glass established perpendicular to the solar stream the following sizes of reflection and absorption of solar energy are established (Table 1):

Table 1. Ratio of reflection coefficient and absorption of solar energy for glass (http://dateandtime.info/ru, 2016)

Angle	For a horizontal surface		Effective Panel Square in % to the real area
	Reflec-tivity	Transmission factor	
0° - 30°	5%	95%	100%
30° - 60°	10%	90%	80-75%
60° - 70°	20%	80%	50%
70° - 80°	40%	60%	45-40%

These indicators are important for the choice of the placement of solar batteries in northern territories because during the winter period it is necessary to consider existence of snow cover and it is needed to clean the surface of batteries accepting radiation of snow.

The second factor which is necessary to consider making a choice of a tilt angle of solar batteries is concept of the effective area of the panel" - the radiation stream section blocked by the area of the panel.

The effective square of the panel is equal to the real area of the panel increased by a cosine of the angle between the direction of a stream and a perpendicular to the panel (or sine of the angle between its plane and the direction of a stream). Thus, if the panel is perpendicular to a stream, its effective area is

equal to its real area, but if the stream is deviated from the perpendicular -it is equal to a half of the real area.

Thus, the essential deviation of a stream from a perpendicular to the panel not only increases reflection, but also reduces its effective area that leads to even more essential falling of the development coefficient of the solar battery. In these conditions the most effective continuous orientation of the solar panel is perpendicular to the stream of sunshine. However, it demands change of position of the panel in two following planes:

1) depending on the provision of the Sun in the sky during a day,

2) depending on the provision of the Sun in the sky on a year season.

Creation of such systems is technically feasible, however so far they turn out very difficult, expensive and not really reliable. Therefore, now the main research are conducted in the direction of search of the most optimum angle of the inclination of the solar panel in relation to the stream of sunshine in the stationary mode (without turn) or with one rotary mechanism.

Also it is necessary to consider a season in all calculations as for the different seasonal periods. As it is already noted, receipt of solar energy significantly differs. Respectively, also values of sine (cosines) of a angle between its plane and the direction of a stream will be various. So, for example, for Perm for 4 main dates: On March 20, on June 21, on Seph_{Θ}nber 22, on December 21 in astronomical midday (the Sun azimuth (Ψ) - 180°) cos h_{Θ} is 0.847 values; 0.567; 0.847 and 0.988 respectively. The value of sin h_{Θ} is according to 0.531, 0.82, 0.531 and 0.148 respectively.

The calculations of the angle of the sun maximum rising over the horizon within a year for the cities of Russia (Appendix 1).

4. DISCUSSIONS

For the choice of the optimum angle of the solar panel inclination it is necessary to calculate the angle of the maximum raising of the Sun over the horizon within a year. For different geographical coordinates this difference will be a miscellaneous. The results of calculations for the cities of Russia are presented in the Table 2 (Appendix).

As it was already noted, calculations were carried out for four dates: On March 20, on June 21, on September 22, on December 21, 2014 in astronomical midday when the maximum eminence of the Sun over the horizon is observed. Sun azimuth size makes 180° at this time. For different latitudes astronomical midday falls on average on 12:00-13:00 local times.

Generally sunshine duration at the territory of Russia is between 1 700 and 2 000 hours per year. Only 1/3 of its territory has sunshine duration, which is more than 2 000 hours per year.

From the Table 2we can see that only in 4 analyzed cities such as Vladivostok, Sochi, Astrakhan, Rostov-on-Don the duration of light day exceeds the necessary level for effective development of solar power generation during the whole year (8 hours in the winter).

It is also possible to include the Chita in this list of the Russian cities, in which it is possible to use solar collectors (panels) during the whole year round.

Chita is the leader among the Russian cities in quantity of sunny days during a year – it has 284sunny days per year (nearly 78% of year). It allows developing of solar energy even during the autumn and winter period with insignificant decline in production of solar batteries.

Time of rising and sunset gets to an interval of the greatest maximum of solar energy: from 9 to 15 hours. A large number of sunny days in a year are also in Omsk, however duration of light day is significantly lower in the winter. Therefore the unambiguous decision on expediency of year-round using of solar batteries in Omsk is not present.

It should be noted that there are solar collectors already allowing making heat even in cloudy weather that is applicable for many regions of Russia. In the number of Russian cities the experiment has already been made on transfer of solar power to heating systems and hot water production in apartment houses. The best European experience (Romanian, German, etc.) is implemented in the most advanced and sunny Russian cities such as Moscow, Sochi, Yekaterinburg, etc.

For example, in Yekaterinburg in the one of highrise apartment houses (Rodonitovaya St., 8), the vacuum solar collectors, absorbing the radiation of the sun at all seasons of the year, even in cloudy weather, are installed successfully. By calculations of experts, energy of the sun in the Ural has to be enough for heating of the building. The average day sum of the solar radiation in the region makes 2.9 kilowatt-hours on square meter whereas in Krasnodar this indicator is only a bit more than 3.5.

The main objective of experts is the definition of the correct tilt angle of the solar panel to provide the maximum receipt of the solar energy in a cold season.

Theoretical calculations showed that for all analyzed Russian cities the angle of the maximum raising of the Sun over the horizon within a year deviates average situation no more than on ±23.5° (the general difference between the maximum tilt angle and minimum makes 46.87°). Thus, as we already noted, the effective area of the panel at a deviation from a perpendicular ° remains on 23-24 rather big - about 90% of its real area.

Therefore for the analyzed cities it is possible to use the simplest option of increase of overall performance of the solar battery – rotation of the solar battery only in one plane - round a polar axis of Earth with a speed of 1turn per day. The tilt angle of an axis of such rotation concerning a horizontal is equal to geographic latitude of a place.

It is necessary to organize the sliding connection allowing to take away all energy received by it, or to be limited to flexible communications with the fixed connection. But in both cases it is necessary to provide automatic return of the panel back at night from constantly rotating panel, otherwise it is not possible not to avoid twisting and break of the communications which are taking away energy.

Also both decisions sharply increase complexity and reduce reliability of system. In the case of increasing of power of panels' complexity, their sizes and weight, technical problems start to grow in a geometrical progression.

Already now are developed and applied the systems allowing tracing the provision of the Sun, solar tracker system. However, practically all of them are created for rather small weight and small windage of the turned panels. The horizontal placement of the solar panels in the whole territory of Russia is inefficient. Besides too big decrease in the development of the solar energy production during the autumn and winter period dust and snow are often accumulated on horizontal panels. It is possible to remove them from the batteries only by means of specially organized cleaning. If the inclination of the panel exceeds 60°, snow on its surface is late a little and is usually quickly showered by itself, and also the dust is well washed away by rains from its surface.

However, it is necessary to remember that panels with an inclination of 85°, almost vertically, after more or less considerable snowfall will not remain free from snow, especially if snow was though slightly sticky. The layer of this snow will be thinner. Usually on smooth surfaces (glass, plastic) with an inclination more than 60° (a bias 2:1 and more) snow keeps from several hours to several days depending on weather in frosts. At the same time at a bias 40° less snow can be late for the entire period of cold weather to the first thaw. If its volume will freeze, the snow cap can remain without cleaning till spring.

The choosing of tilt angle for solar panels in different Russian cities has been more detailed investigated (Table 2). Everything depends on the right time of exploitation of solar battery, if it is supposed to use solar batteries only during the spring and summer period. It is necessary to choose the optimum tilt angle, perpendicular to the average provision of the Sun during the period between spring and autumn equinoxes. If energy is generating all the year round, it is necessary "to squeeze out" a maximum in power scarce winter months, so, it is necessary to be guided by the average provision of the Sun between autumn and spring equinoxes and to place panels closer to a vertical on 5°-15° more than geographic latitude.

Results of calculations of a tilt angle of solar panels for the analyzed cities of Russia are given in the Table 3.

Table 3. Calculations of a tilt angle of solar panels for the cities of Russia

Cities	Geographical coordinates		The recommended tilt angle of the solar panel	
	Geographic latitude, northern latitude	Geographical longitude, eastern longitude	Sping-Summer period	All year
Vladivostok	43°06′20″	131°52′24″	28°-35°	48°-58°
Sochi	43°35′57″	39°43′32″	28°-35°	48°-58°
Astrakhan	46°20′58″	48°02′26″	31°-36°	51°-61°
Rostov -on-Don	47°13′52″	39°43′23″	32°-37°	52°-62°
Chita	52°01′54″	113°30′03″	37°-42°	57°-67°
The Petropavlovsk -Kamchatsky	53°01′00″	158°39′00″	38°-43°	58°-68°
Omsk	54°59′32″	73°22′06″	39°-44°	60°-70°
Novosibirsk	55°02′29″	82°56′04″	40°-45°	60°-70°
Moscow	55°45′07″	37°36′56″	41°-46°	61°-71°
Yekaterinburg	56°51′06″	60°36′43″	41°-46°	62°-72°
Perm	58°00′37″	56°15′00″	43°-48°	62°-72°
St. Petersburg	59°56′19″	30°18′50″	45°-50°	65°-75°
Petrozavodsk	61°47′05″	34°20′48″	47°-52°	67°-77°
Arkhangelsk	64°32′24″	40°32′35″	49°-54°	69°-79°

If for architectural or constructive reasons it is impossible to sustain such angle and it is necessary to choose between a tilt angle in 40° less or vertical installation, for year-round use it is necessary to prefer vertical situation. Thus energy "shortage" in long summer days is not so critical, during this period people's demand in heating and electricity are not high, and the need for development of energy is usually not so great, as in the winter and in off-season.

5. CONCLUSIONS

In the course of research it was revealed that solar installations can be useful in a midland and even in many more than northern areas. In Perm and Sverdlovsk Regions during long days, at least half a year between spring and to autumn equinoxes, they are quite effective.

The main directions of use of solar collectors in Perm and Sverdlovsk Regions are production of low energy for heating of rooms, and also application of solar installations for actuating of conditioners during the hot summer period which is rather long and a little comfortable in all large cities of Russia.

Thus, our conclusions concerning the arrangement of the solar collector position are the following: the collector has to be located properly for providing free pass of sunshine from 9 to 15 hours since at this time solar energy is at maximum.

It is expedient to establish a collector-faced to the south at an angle corresponding to installation width. It is possible to have variations in productivity till 20 degrees from the south since they do not influence the productivity of heat of a collector. In houses it is necessary to apply the combined power sources for generation of heating and electricity.

The main direction of current research is to clarify the most optimum, effective and the least expensive combinations of various energy carriers for ensuring heat, hot water and the electric power in residential and office buildings of the Russian cities located in a midland and more northern areas.

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NOMENCLATURE

Ψ sun azimuth, [°]
h_Θ angle between the plane and the direction of a stream of solar energy, [°]
cos h_Θ cos of angle between the plane and the direction of a stream of solar energy, [-]
sin h_Θ sin of angle between the plane and the direction of a stream of solar energy, [-]

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Appendix 1

Table 2. Calculations of the angle of the Sun maximum rising over the horizon within a year for the cities of Russia

Date	20 of March	21 of June	22 of September	21 of December	Number of sunny days in a year
Ψ (Sun azimuth)	180°	180°	180°	180°	
Vladivostok (43°06'20" northern latitude)					
Astronomical midday	13:20	13:14	13:05	13:10	269
$h_□$	46.61	70.32	47.31	23.45	
Duration of light day, hours	12h 7m 46s	15h 22m 37s	12h 12m 0s	8h 59m 37s	
Sunrise	8:16	6:32	7:59	8:40	
Sunset	20:23	21:55	20:11	17:40	
Sochi (43°35'57" northern latitude)					
Astronomical midday	12 28	12 22	12 13	12 19	190
$h_□$	46.12	69.84	46.83	22.97	
Duration of light day, hours	12h 9m 28s	15h 26m 18s	12h 10m 30s	8h 56m 10s	
Sunrise	7:23	5:39	7:08	7:51	
Sunset	19:33	21:06	19:19	16:47	
Astrakhan (46°20'58"northern latitude)					
Astronomical midday	11 55	11 49	11 40	11 46	259
$h_□$	43.39	67.10	44.09	20.23	
Duration of light day, hours	12h 9m 52s	15h 48m 18s	12h 11m 9s	8h 35m 48s	
Sunrise	6:50	4:55	6:34	7:28	
Sunset	19:00	20:43	18:46	16:03	
Rostov-on-Don (47°13'52" northern latitude)					
Astronomical midday	12 28	12 22	12 13	12 19	199
$h_□$	42.49	66.20	43.19	19.33	
Duration of light day, hours	12h 13m 32s	15h 55m 57s	12h 11m 17s	8h 28m 45s	
Sunrise	7:21	5:24	7:08	8:04	
Sunset	19:35	21:20	19:19	16:33	
Chita (52°01'54" northern latitude)					
Astronomical midday	13 33	13 27	13 18	13 23	*284*
$h_□$	37.69	61.40	38.78	14.53	
Duration of light day, hours	12h 9m 20s	16h 44m 32s	12h 14m 21s	7h 44m 28s	
Sunrise	8:28	6:05	8:11	8:31	
Sunset	20:38	22:49	20:25	16:16	
The Petropavlovsk-Kamchatsky (53°01'00" northern latitude)					
Astronomical midday	13 33	13 27	13 18	13 23	47
$h_□$	36.61	60.42	37.51	13.55	
Duration of light day, hours	12h 8m 39s	16h 56m 39s	12h 15m 36s	7h 33m 34s	
Sunrise	7:28	4:58	7:10	9:36	
Sunset	19:37	21:55	19:26	17:10	
Omsk (54°59'32" northern latitude)					
Astronomical midday	13 14	13 08	12 59	13 04	223

Date	20 of March	21 of June	22 of September	21 of December	Number of sunny days in a year
Sunset	20:19	22:49	20:06	16:39	
		Novosibirsk (55°02'29" northern latitude)			
Astronomical midday	12 35	12 30	12 21	12 26	298
$h_{\square}$	34.69	58.40	35.39	11.53	
Duration of light day, hours	12h 10m 54s	17h 23m 13s	12h 14s 38c	7h 9m 47s	
Sunrise	7:30	4:48	7:13	8:51	
Sunset	19:41	22:11	19:28	16:01	
		Moscow (55°45'07" northern latitude)			
Astronomical midday	12 36	12 31	12 22	12 27	114
$h_{\square}$	33.97	57.69	34.68	10.82	
Duration of light day, hours	12h 16m 53s	17h 33m 39s	12h 13m 46s	7h 0m 31s	
Sunrise	7:28	4:44	7:15	8:57	
Sunset	19:45	22:18	19:29	15:57	
		Yekaterinburg (56°51'06" northern latitude)			
Astronomical midday	13 05	12 59	12 50	12 55	150
$h_{\square}$	32.89	56.60	33.59	9.73	
Duration of light day, hours	12h 11m 53s	17h 51m 5s	12h 14m 54s	6h 45m 12s	
Sunrise	7:59	5:03	7:42	9:33	
Sunset	20:10	22:54	19:57	16:18	
		Perm (58°00'37" northern latitude)			
Astronomical midday	13 22	13 16	13 07	13 13	145
$h_{\square}$	31.71	55.42	32.41	8.55	
Duration of light day, hours	12h 12m 20s	18h 11m 21s	12h 15m 21s	6h 27m 33s	
Sunrise	8:16	5:11	8:00	9:59	
Sunset	20:28	23:22	20:15	16:26	
		St. Petersburg (59°56'19" northern latitude)			
Astronomical midday	13 06	13 00	12 51	12 56	105
$h_{\square}$	29.77	53.49	30.48	6.62	
Duration of light day, hours	12h 13m 52s	18h 50m 54s	12h 15m 26s	5h 53m 49s	
Sunrise	7:59	4:35	7:43	10:00	
Sunset	20:13	23:26	19:59	15:53	
		Petrozavodsk (61°47'05" northern latitude)			
Astronomical midday	12 50	12 44	12 35	12 40	16
$h_{\square}$	27.94	51.55	28.64	4.78	
Duration of light day, hours	12h 14m 39s	19h 38m 49s	12h 16m 28s	5h 14m 35s	
Sunrise	7:42	3:55	7:27	10:03	
Sunset	19:57	23:33	19:43	15:18	
		Arkhangelsk (64°32'24" northern latitude)			
Astronomical midday	12 25	12 20	12 10	12 16	108
$h_{\square}$	25.17	48.89	25.88	2.02	
Duration of light day, hours	12h 15m 59s	21h 31m 26s	12h 18m 17s	3h 53m 48s	
Sunrise	7:17	2:33	7:01	10:19	
Sunset	19:33	0:05	19:19	14:12	

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Laplace, P. S. (1951). A philosophical essay on probabilities (FW Troscott & FL Emory, Trans.). New York: Dover. (Original work published 1814)

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