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Benefits of teaching outside the classroom and effects on knowledge retention

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Abstract

Natural and social environments provide excellent opportunities for the application of integrated and constructivist approach to teaching and practicing of a variety of teaching and learning strategies. In this sense, the objective of this study was to examine how a programme of integrated learning outside the classroom “The Danube – a classroom on the water “ effects immediate short-term and long-term retention of the presented content. The survey was conducted on a sample of 120 third grade primary school pupils who were divided into the experimental (N=60) and control group (N=60). Pupils of the experimental group participated in the outdoor learning project “The Danube – a classroom on the water”, whereas pupils of the control group were taught the same content in the classroom through regular teaching methods – lecturing and presentation. The results of this study demonstrate the benefits of integrated outdoor teaching in respect to knowledge retention. Thus, the necessity to increase teaching hours outside the classroom in schools in Serbia is recommended in order to improve the quality of students’ knowledge retention.

Keywords: Integrated approach, constructivist approach, integrated outdoor teaching, knowledge retention.

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1. Introduction

In a globalized society, there is a need to improve the quality of education at all levels and to adapt it to the needs of the contemporary international labor market and multicultural societies. Significant number of official documents in many countries, especially in the European Union, indicate the need to increase the quality of education since it presents the foundation of the overall development of society. In order to adapt to the new circumstances and comply with the European standards, the reform of the education system in Serbia and improvement of the quality and efficiency of education present a priority for the Serbian society (Law on the Fundamentals of the Education System, 2009; Strategy for the development of education in Serbia until 2020, 2012). In this sense, the reform process that is based on the extensive analysis of education in Serbia (Kovac-Cerovic et al., 2004; Vujcic et al., 2011; Baucal, 2012) has been conducted. Quality and efficiency of education depends on the quality and efficiency of teaching, on learning outcomes and students' academic competences. Former education reforms in Serbia were mainly aimed at changing the structure and content of curricula, whereas, in recent years significant changes have been made in respect to structure and organization of the teaching process itself.

Results of international studies in the field of education, including the Program for International Student Assessment in which Serbia has participated since 2001, demonstrate lower results of the Serbian students, especially in terms of functional knowledge. This is consistent with the findings of studies dealing with the quality of education in Serbia, which show a significantly lower score of the Serbian students compared to the average of the region (Gasic-Paviscic & Stankovic, 2011; Baucal, 2012; Pavlovic Babic & Baucal, 2013). In Serbian schools, pupils are mostly demanded to reproduce facts learned by heart rather than to make serious intellectual effort, which consequently leads to creation of conditions that do not allow development of pupils' intellectual capacities (Pavlovic-Babic & Baucal, 2011). Particularly worrisome are educational achievements of the Serbian pupils in the field of scientific and functional literacy, which implies development of "skills and competencies that help a pupil observe phenomena, analyze, make creative decisions, participate actively in learning, judge and act responsibly towards himself/herself, others and the environment" (Cvjeticanin et al., 2010, p. 176). This condition raises the question – Do we make pupils study for school tests or do we prepare them for real-life challenges? In order to make learning more meaningful, knowledge must be of higher quality, more lasting and more pragmatic, so as to enable pupils to face challenges in the future. One of the solutions is the use of various teaching strategies and creation of teaching situations in different contexts outside school where pupils are in a position to gain knowledge, develop skills and form attitudes and values through experiential, integrated and problem-solving learning.

2. Learning for Life - Contextual and Integrated Approach to Teaching

In recent years, significant changes have been made in education reforms in Serbia in respect to structure and organization of the teaching process itself. When one of the main goals of teaching presents "development of key competencies, based on the acquired knowledge, which would enable students to recognize situations in which academic knowledge may be relevant" (Baucal, 2012, p. 63), then it is obvious that teaching cannot be limited only to the acquisition of knowledge through lectures in the classroom. The quality of school education, among other things, depends on changes in the learning process that are based on the paradigm shift from the behavioral approach to learning (Giroux, 2011) to the constructivist (Murphy, 1997; Richardson, 1997; Milutinovic, 2012) and contextual (Pierce & Jones, 1998; Putnam, 2000; 2001; Johnson, 2002) approaches to education and teaching. Linking learning content to context in which it will be used (Kelley & Kellam, 2009; Verbitsky & Kalashnikov, 2012) presents an important determinant of changes in the teaching process. Learning for life and preparing pupils for various social roles are considered as main outcomes of teaching (Andjelkovic & Stanisavljevic-Petrovic, 2013). In this sense, the need for direct and active interaction with the real world becomes a guiding principle in the organization of teaching. Immediate contact with nature, investigative and creative attitude of pupils towards natural and social environments are

becoming important segments of the contemporary teaching that is focused on pupils. Therefore, learning is perceived as “an active process resulting from the interaction between pupils and the environment”(Cindric et al., 2010, p. 183). Immediate contact with objects of knowledge, which is realized primarily through research tasks, projects and workshop activities outside the classroom, affects knowledge retention, motivation and satisfaction of pupils (Boric & Skugor, 2014).

2.1. Integrated outdoor teaching

Learning in the classroom is very different from learning in authentic natural and social environments, as the latter provides opportunities for using various learning strategies, enables integration of knowledge from different fields and is performed in a positive educational climate (Andjelkovic & Stanisavljevic-Petrovic, 2014). Life in big cities, alienation, isolation from nature, communication via the Internet and reduced physical activity are some of the reasons why we search for strategies that will humanize and connect educational process with the primordial human need to be a part of nature. Return to nature that helps develop perception and awareness of holistic unity and cohesion of phenomena and processes in nature and society is essential for humanizing educational process. This perspective implies “integration of outdoor spaces into school curriculum, connection of school with the immediate environment and realization of educational process in authentic contexts” (Andjelkovic & Stanisavljevic-Petrovic, 2013, p. 40). Local environment with its natural, social, cultural and traditional aspects becomes not only the venue, but a source, means and object of teaching and learning (Andjelkovic & Stanisavljevic-Petrovic, 2014a). Therefore, integrated approach in teaching and learning is increasingly becoming more significant. “Integrated teaching is a contemporary model of teaching that helps students create experiential connections while building knowledge structures. It helps in observing a problem from multiple angles (viewpoints), in understanding the connections between natural and social factors in reality and makes experience of the world comprehensive, rather than fragmented” (Husanovic-Pejnovic, 2011, p. 36). Integrated approach helps students develop a holistic, comprehensive view of the world, which among other things, implies integrated use of knowledge of a variety of scientific disciplines when dealing with life problems (Dryden & Vos, 2005). It is often emphasized that outdoor teaching contributes to connecting school and local environments and creating links between what is taught in the classroom and the real world (Andjelkovic & Stanisavljevic-Petrovic, 2014).

Furthermore, interdisciplinary teaching is thematic because different contents are organized in thematic units. Research by Borich (2007) indicates that interdisciplinary teaching contributes to development of higher cognitive levels and higher quality learning because students are introduced to interactive learning and knowledge construction. Interdisciplinary approach to teaching also enables the use of different teaching strategies, which allow a more profound understanding of content and more meaningful learning, and affect students’ academic achievements (Dolenec & Dolenec, 2013). Studies have demonstrated benefits of learning outside the classroom (Szczepanski et al., 2007; Bentsen et al., 2010; Jordet, 2010; Beames & Ross, 2010), but have also indicated that organization and distribution of classes make it more difficult to organize integrated thematic teaching outside the classroom in senior years of primary and secondary schools.

3. “The Danube – A Classroom on the Water” – An Experimental Programme of Integrated Outdoor Teaching

“The Danube – a classroom on the water” is an experimental programme of integrated outdoor teaching that was conducted for four years onboard a boat “Heart of Gold” in Belgrade, Serbia. About 2,000 primary school pupils of lower grades and 40 teachers and educators from twenty towns in Serbia participated in the programme. The programme implied training in integrated, problem-solving teaching. The following contents were included: river geography, history and cultural heritage of the Danube river valley settlements, The Danube river wildlife, river ecology, river traffic, economic importance of the Danube River, etc. By studying the main theme – the river Danube, through

integrated learning, pupils acquired knowledge and developed a variety of skills and abilities, for example, using binoculars and a microscope. They could see river whirlpools, river banks, river islands, the estuary, river fauna (birds and small animals), river relief, etc. Also, they could learn about river transport and boat navigation, they got acquainted with the river ecology and cultural and historical heritage of the Danube river valley settlements. Teaching content as well as their extent were adjusted to the age of pupils who participated in the programme. They were also adapted to the specific needs of age-homogeneous and age-heterogeneous groups. The following topics were included:

- River: river course from source to mouth, river bed, river banks, the concept of tributaries, the concepts of river basin and river network, backwaters, river islands, etc;
- Heritage – river bank settlements from prehistory to present day, introduction to the Vinčan culture and the culture of Lepenski Vir (two most important prehistoric settlements in Serbia), history of the fortresses on the Danube (Petrovaradin in Novi Sad, Kalemegdan in Belgrade, the Smederevo Fortress, the Ram Fortress, the Golubac Fortress), their conquests and defense, The Danube river battles;
 - River traffic: types of vessels in river transport and their recognition, navigation regulations and signs, buoys and marks as traffic signs;
 - River and river valley wildlife: river flora and fauna and their interdependence, connectivity of animate and inanimate nature in a river ecosystem, food chains;
 - Ecology: types of river pollution and prevention of pollution, effects of pollution, endangered species and their protection;
 - Importance of rivers for the economy: importance of the Danube for agriculture, tourism, hunting and fishing, industry and energy production.

In addition to this content, pupils learnt about a boat's structure, boat's crew, they practiced wearing lifejackets and learnt the rules of conduct on board. Also, after sailing, pupils engaged in group work to write a report and design a travel guide "Meet the Danube" for their peers from other parts of Serbia.

The basis of the programme "The Danube – a classroom on the water" is the educational programme "The Danube Box" – a comprehensive educational toolkit for teachers and educators who work with pupils aged 9 to 12 years. "The Danube Box" is an ICPDR project that was created with the aim to offer a wide range of information on ecology, geography, wildlife, cultural diversity and everyday life in the past and present in the Danube basin countries in order to raise pupils' awareness of the need to protect the Danube, develop ways for its sustainable use and improve knowledge and skills required for these projects.

4. Research Methodology

The aim of the research was to determine whether integrated learning outside the classroom through "The Danube – a classroom on the water" experimental programme of integrated outdoor teaching has a positive effect on the immediate (short-term) and long-term retention of knowledge. The survey was conducted in 2015-16 academic year. It included 120 pupils from four third-grade classes of primary schools in Pozarevac (Serbia). The experimental group consisted of 60 third-grade pupils who participated in the programme of integrated teaching outside the classroom "The Danube – a classroom on the water", and the control group of 60 third-grade pupils who studied the same content in the classroom through lectures and demonstrations. The groups were uniform by gender structure and academic achievement. Both groups were tested twice with the same knowledge test of 19 open and closed questions: the first time right after teaching, and the second time in four months. The basic descriptive data for both groups (min, max, M, SD) were calculated. In order to test statistical significance of differences between academic achievement of the experimental and the

control group, as well as differences in achievement on tests administered immediately after teaching and four months later, we applied the analysis of variance (ANOVA), with a single factor non-repeated subjects. The data was processed through a standard SPSS 13.0 programme.

5. Results and Discussion

The basic descriptive data for the experimental and the control group were calculated in respect to the first and the second test (min, max, M, SD).

Table 1. The difference in the knowledge test results between the first and the second test in the experimental group

Experimental group	N	min-max	M	SD
First test	60	1-19	17.62	1.5
Second test	60	1-19	16.87	1.94

The analysis of variance indicates that there is a statistically significant difference between the first test and the subsequent test in both groups, which shows that there is a natural process of forgetting in both groups. In both groups, the results demonstrate a decrease: in the experimental group, the mean value of M = 17.62 dropped to M = 16.87 (Table 1), whereas in the control group, it fell from M = 17.02 to M = 11.18 (Table 2). Both declines are statistically significant, in the experimental group the significance is at $p < 0.05$ with Fisher coefficient of 5.639; in the control, there is a slightly higher significance level of $p < 0.001$, with Fisher coefficient of 146.9, which indicates that the decline was higher at the repeated test in the control group than in the experimental group (Table 2).

Table 2. Analysis of the significance of differences between the obtained measures

Comparison	n	Df	f	1. Significance p
Experimental group First test – Experimental group Second test	120	59	5.639	2. 0.05*
Control group First test – Control group Second test	120	59	146.9	0.001***
Experimental group First test – Control group First test	120	59	3.63	0.07
Experimental group Second test – Control group Second test	120	59	139.12	0.001***

The results of the comparison indicate that there is no statistically significant difference (however, there is a tendency towards marginal significance) in the achievements at the first test between the experimental and the control group, which means that integrated outdoor teaching does not affect significantly knowledge retention soon after learning. However, there is a highly significant difference in the degree of retention over time. On the test administered four months after teaching,

respondents in the experimental group demonstrated a significantly higher level of retained knowledge in comparison to the control group ($p < 0.001$, $F = 139.12$).

The analysis demonstrated that statistically significant differences in the degree of knowledge retention that were observed in the second test after four months result from the passage of time. Both groups forgot some content, but the experimental group showed a significantly higher degree of knowledge retention in comparison to the control group, which means that knowledge gained through this teaching strategy was more permanent compared to knowledge acquired through traditional teaching in the classroom. This indicates that pupils in the experimental group confirmed importance of integrated outdoor teaching in achieving one of the most important goals of teaching – knowledge retention.

The results obtained are consistent with findings of studies that examine the quality of education in Serbia, which show significantly lower scores of the Serbian pupils compared to the average score in the region in respect to retention of knowledge gained in regular classes (Baucal, 2012). Also, pupils' evaluation of the quality of teaching indicates that it must be improved because it is often seen as passive and mostly boring (Plut & Krnjajic, 2004). One of the ways to overcome this disadvantageous situation is to implement new teaching and learning strategies that have positive effects on both pupils' motivation and knowledge retention, such as integrated learning outside the classroom. Research results of other educators also highlight the benefits of integrated outdoor teaching in terms of knowledge retention and positive impact on learning outcomes (Boric & Skugor, 2014). Also, our results demonstrate benefits of integrated outdoor teaching in respect to knowledge retention and the necessity to increase the share of outdoor teaching and learning in schools in Serbia in order to improve the quality of students' knowledge and create an adequate social climate for sustainable, interdisciplinary study and use of natural and social contexts as resources for teaching and learning.

6. Conclusion

The results of our research indicate that the main outcome of integrated outdoor teaching in “The Danube – a classroom on the water” experimental programme is knowledge retention, and that there is a need to increase the share of integrated outdoor teaching especially in the lower grades of elementary school. However, the idea of outdoor teaching and learning has not been sufficiently implemented in Serbian schools. It is necessary to conduct further research in order to improve the assessment of advantages and disadvantages of different aspects of integrated outdoor teaching and its effects on pupils' achievement, their intellectual, emotional, social and physical development. Furthermore, development of holistic, thematic based curricula is essential if natural and social environments are to be studied. This problem should be given more attention, both in the initial education of teachers and through professional training. In future studies, existing practices of integrated outdoor teaching in Serbia should be assessed critically and promotion of contemporary teaching methods should be advocated if we want to develop purposeful teaching focused on students.

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