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Orienteering as a Means of Promoting Cross-Curricular Teaching: Status and Perspectives

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Abstract

Orienteering as a sporting and competitive as well as recreational and educational activity is increasingly being carried out by various sports associations, hikers and other amateur sportspeople. Its implementation involves class and subject teachers in schools, especially those involved in the GLOBE programme. The aim of this paper is to examine the presence of orienteering or some of its elements in the school and subject plans and programmes of both lower and higher grades of primary, as well as secondary schools in the Republic of Croatia, and a possible role of orienteering in promoting cross-curricular teaching. Because of the desire to supplement the teaching methods and forms of work with more work outside the classroom, the purpose of this paper is to contribute to forming a justified demand for incorporating orienteering in the primary school curriculum in Croatia. Since orienteering is particularly significant from the point of view of Geography and Physical Education teaching, the existing curricula of the two subjects have been analysed to identify possible cross-curricular links. This paper presents the results of the research conducted in 2017 and 2018 on a sample of 146 Geography and Physical Education teachers from Croatia. The results indicate that teachers are familiar with these activities. Although they recognize the potential in terms of the wish to integrate some contents into teaching plans and programmes, as well as contribute to cross-curricular teaching, the content of orienteering is implemented very rarely or not at all in primary, and even less, in secondary schools. The results of this research also point to the lack of class and subject teacher competences and their poor knowledge of this area.

Key words: *correlation; Geography; orienteering; out-of-classroom teaching; Physical Education.*

Introduction

Orienteering implies planned movement across an unknown or known terrain with the basic goal of orientating oneself and finding, as quickly as possible and with the aid of a map and compass, the previously assigned control points drawn on the map (Gobec, I., & Gobec, D., 2003; Trkulja Petković, Podvalej, & Širić, 2009).

The beginnings of orienteering as a sport date back to the late 19th century when it was an integral part of military exercises in Sweden and Norway. Orienteering affirmed itself as a competitive sport in the first decades of the 20th century, and after World War II it spread across Europe and the world (Kjellström, 1976; Zentai, 2014). In Croatia, orienteering is a relatively new sport. Although in some parts of Europe orienteering has had a long tradition, the Croatian Orientation Union was not founded until 2005 (Adventure Sport, http://www.adventure-sport.net).

Along with orienteering as an Olympic sport, orienteering as a programme (activity) is also practiced by various sports associations, mountaineers and other amateur sportspeople, as well as an increasing number of teachers in schools. Orienteering significantly contributes to the development of students' cognitive, physical and social abilities (Vukadinović, Juhas, & Kozoderović, 2015). Cognitive requirements relate to the choice of relevant information on the map for the purpose of selecting the route of movement and comparing the map and surrounding terrain when reading the map (Seiler, 1996). This sporting activity contributes to the increase of students' physical strength (whereby "mind work" diverts attention from physical effort), improves coordination and agility, encourages students to show initiative and creativity in solving problems, induces an experience of success after finding each control point, develops a sense of responsibility (students must find the right path and perform the task within a given time) (Hnilica & Hnilica, 2001). Spending time actively outdoors, i.e. psycho-physical activation of the body, contributes to students' health, which is one of the main objectives of Physical Education (Lorger & Braičić, 2014).

In accordance with the above-mentioned, the question arises about the possibilities of introducing orienteering in schools. An additional stimulus to its implementation is the GLOBE programme within which the participating schools conduct orienteering. Due to the complexity of the mapping process, organizational and other reasons, this sporting activity frequently needs to be adapted to the activities (content) intended for students. Orienteering can be part of the Physical Education curriculum, or it can be implemented as an extracurricular activity. Since primary school teaching plan and programme in the Republic of Croatia does not include orienteering, this activity is mostly realized as part of extracurricular activities. Although the situation is similar in Croatian secondary schools, grammar school teaching plan and programme for Physical Education lists orienteering among the sports recommended as a supplementary programme.

Orienteering can contribute to fulfilling goals of different school subjects and their interdisciplinary connections (Baker, 2003; Tammaro, D'Alessio, & Petolicchio, 2017):

Physical Education (running, walking), Geography (orientation, map, scale, azimuth, landforms...), Mathematics (line segment, line, angle construction, measurements...), Nature and Biology (the impact of physical activity on cardiovascular, muscular and nervous system...). Correlation with orienteering can also be achieved with topics listed in the plan and programme of some other school subjects, such as health topics, environmental protection and sustainable development.

A number of students' manuals and guides have been written on the implementation of orienteering in schools with the aim to help students acquire orientation skills and techniques. In addition, guides have also been written for teachers to assist them in planning the teaching process. McNeill, Wright, and Renfrew (1998) are authors of the book *Teaching Orienteering*, and the book in German dealing with the same topic is the manual *Orientierungslauf für die Schule,* written by Daschiel, Döhler, Roche, and Zangerl (2012). Little attention has been dedicated to scientific research investigating orienteering in the teaching process and school in general. Most papers dealing with orienteering emphasize its influence on the physical and mental health of students (Chun-xia, 2005; Goncharova & Butenko, 2015; Galan, Zoriy, Briskin, & Pityn, 2016; Mayorkina, 2015; Zhang, Jan, Zhao, & Huang, 2001). The sociological aspect, i.e. students' interaction during the orienteering class was studied by Jourand, Adé, Carole, Komar, and Thouvarecq (2017), while Baker (2003), Mihelčić (2015) and Tammaro et al. (2017) reported on the role of orienteering in cross-curricular teaching. The possibilities of applying orienteering in teaching in Croatia were first discussed by Jenko (2008, p. 514), who pointed out that orienteering "could contribute to the modernization of the educational process with its content as well as enable the acquisition and acceptance of everyday physical activity". Academic research focusing on the importance of orienteering in teaching Geography and pointing to cross-curricular links with the teaching of Physical Education are not known to the authors of this article.

Correlation of Orienteering with the Contents of Physical Education and Geography

In the countries with a long tradition of orienteering as a sporting activity the contents of orienteering are an integral part of Physical Education, and sometimes also of other subjects. Orienteering has been included in the teaching plan and programme in Sweden since 1948 (Action Centered Training, http://www.corporateteambuilding.com), and for more than a decade it has been included in the national curricula of primary and secondary schools in Finland, Norway, the United Kingdom, Germany and elsewhere.

Although German education system is considerably different from the Croatian, implementation of orienteering in the curriculum will be illustrated on the example of the education system in the German province of Bavaria. Orienteering is already present at the beginning of education in the teaching plan and programme in Bavarian

primary school (*Grundschule*). In the plan and programme of Physical Education (*Sporterziehung*) and Nature and Society (*Heimat-und Sachkunde*) the game of orientation and quest are mentioned (1st grade of primary school), followed by observation and orientation exercises on the school grounds and in the surrounding area, running with specific tasks (2nd grade), running with stations, orienteering with a map and other activities (3rd and 4th grade) (Staatsinstitut für Schulqualität und Bildungsforschung [ISB], 2000). Orienteering contents are also present at higher levels of education (Daschiel et al., 2012). A more detailed analysis was conducted on the example of grammar school plan and programme in Bavaria, where the first four grades (5th-8th year of schooling), considering students' age, correspond to the higher grades of primary school in Croatia (5th-8th grade) (Table 1). In the Physical Education plan and programme (German *Sport*) teaching contents related to orienteering are arranged in the form of concentric circles, e.g. in the 5th year of schooling students need to solve simple tasks, in the 6th year orienteering tasks are somewhat more complex, in the 7th year the students solve orienteering tasks in smaller groups, and in the 8th year the students engage in orienteering with additional tasks. On the other hand, one of the goals of Geography classes in the 5th year of schooling in grammar schools in Bavaria is to train students for orientation on the earth's surface. Drawing cartographic sketches is mentioned several times in Geography and Physical Education plans and programmes (Staatsinstitut für Schulqualität und Bildungsforschung [ISB], 2009). These topics are the basis for cross-curricular teaching of these two subjects. Therefore, the integration of orienteering in the Physical Education curriculum in Croatian primary schools would expand the possibilities for cross-curricular teaching with Geography.

In higher grades of primary and secondary Croatian schools orienteering activities are mostly correlated with the topics of Physical Education and Geography. However, students' first encounter with orienteering should be in the lower grades of primary school (1st to 4th grade) when geographic topics are taught within Nature and Society (Lorger & Braičić, 2014). From the point of view of the teaching plan and programme for Nature and Society, orienteering should be introduced in the 3rd grade, when students acquire basic concepts related to the cardinal and intermediate directions, and they need to be taught the basic cartographic literacy in order to be able to read maps (Obad, 1997).

In order to identify the possibilities of the two subjects, Geography and Physical Education, for cross-curricular teaching, their primary school plan and programmes have been analysed. Taking into account the teaching plan and programme guidelines in Croatia, cross-curricular teaching of Geography and Physical Education in higher grades of primary school would be justified in the 5th and 8th grade (Table 2), when orienteering is a common topic for these two school subjects. Based on the knowledge acquired in the subject Nature and Society, students should first revise the cardinal and intermediate directions and the ways to orientate themselves when outdoors, and

then they should be familiarized with orientation on maps (Jelić, 2002). In the 5th grade, students need to acquire the concept of azimuth because outdoor movement with a map implies its use (Jelić, 2002). From the aspect of Geography teaching, the basic goal of out-of-classroom integrated teaching is to teach students how to orientate themselves outdoors and on the map, while one of the fundamental educational goals is to develop self-confidence when moving independently. In the case presented, the basis of cross-curricular teaching is linking the teaching contents related to orienteering topics in Geography and running (e.g., mastering obstacle course in the natural environment) within Physical Education.

Table 1

Overview of the subject topics and contents related with orienteering and students' movement in the context of cross-curricular teaching of Geography and Physical Education in the lower grades of Bavarian grammar school (5th-8th year of schooling)

Geography (*Geographie*)	**Physical Education (*Sport*)**
5th year of schooling	
• **Planet Earth** – *orientation on the earth's surface: cardinal directions, grid mapping.* • **Geographic techniques and work methods** – *working with a map: using a city map;* – *determining cardinal directions, reading simple topographic, physical and geographic and thematic maps; drawing cartographic sketches, etc.;* – *thematic research: e.g., eco rally.*	• **Leisure and environment** – *orientation in the area of the new school and its surroundings;* – *realizing that the experience of outdoor movement is possible during all seasons;* – *solving simple orientation tasks using cartographic sketches* • **Sports games** – *free running and orientation on the surfaces intended for sports games.*
6th year of schooling	
Note: According to the curriculum for grammar schools in Bavaria, Geography is not taught in the 6th year.	• **Leisure and environment** – *sensitizing students for the experience of movement during all seasons and weather conditions;* – *solving orientation tasks using cartographic sketches.*
7th year of schooling	
• **Geographic techniques and work methods** – *drawing cartographic sketches.*	• **Leisure and environment** – *providing students with the possibility of movement in a wider area, not just in the immediate vicinity of the school;* – *creating cartographic sketches of the wider school area;* – *solving simple orientation tasks in smaller groups.*
8th year of schooling	
• **Geographic techniques and work methods** – *drawing cartographic sketches.*	• **Leisure and environment** – *drawing cartographic sketches;* – *orienteering in smaller groups with additional tasks.*

Source: Lehrplan für das Gymnasium in Bayern, ISB, München, 2009.

Table 2

Overview of the plan and programme topics and contents related to students' orientation and movement in higher grades of primary schools in Croatia according to the possibilities of cross-curricular teaching of Geography and Physical Education

Geography	Physical Education
5th grade	
• **Map scales and types** – *recognizing topographic signs on a drawing and using them.* • **Orientation** – *orientating oneself in space (outside the classroom);* – *orientating a map or a plan in the school environment;* – *moving successfully with the compass, a sketch, a plan, and a map in the school environment;* – *explaining the importance of orientation in everyday life.*	• **Running** – *cyclical movements at different rates up to 6 minutes;* – *running fast up to 60 meters from the low start;* – *overcoming obstacles in the natural environment.*
6th grade	
Note: there are no topics directly related to orientation in the environment.	• **Running** – *running at different rates up to 6 minutes;* – *running fast up to 60 meters from a low start;* – *overcoming obstacles in the natural environment.*
7th grade	
Note: there are no topics directly related to orientation in the environment.	• **Running** – *running at different rates up to 6 minutes;* – *running fast up to 60 meters from a low start;* – *overcoming obstacles in the natural environment – relay racing with passing the baton underhand.*
8th grade	
• **Geographic latitude and longitude** – *determining current location by means of a GPS device;* • **Topographic maps** – *determining the coordinates and altitude of a given location;* – *being able to move across the terrain with the help of a topographic map and GPS;* – *explaining the importance of a topographic map and the geographic information system, and their application.*	• **Walking and running** – *running at different rates up to 6 minutes;* – *running fast up to 60 meters from a low start;* – *overcoming obstacles in the natural environment;* – *relay racing with passing the baton underhand;* – *kinematic differences in running techniques during short– and long-distance races.*

Source: Nastavni plan i program za osnovnu školu, MZOŠ, Zagreb, 2006.

One of the objectives of Geography teaching in the 8th grade is outdoor movement with the help of a topographic map (Jelić, 2001). Related topics in Physical Education classes, where students are introduced to the therapeutic role of sports (Ministry of Science, Education and Sports [MSES], 2006), are relay racing with passing the

baton, overcoming obstacles in their natural environment, and kinematic differences in running techniques during short- and long-distance races. The aforementioned topics form the basis of cross-curricular teaching of the two subjects in the 8th grade.

Aim and Hypotheses

The basic aim of this paper is to examine the inclusion of orienteering or some of its contents in the teaching plans and programmes of schools and subjects in higher grades of primary and in secondary schools in the Republic of Croatia, and the possible role of orienteering as educational and recreational as well as sporting activity in encouraging cross-curricular teaching of Physical Education and Geography. Its purpose is to contribute to the formation of a justified demand for including orienteering into primary and secondary school plan and programme in Croatia.

According to the set research aim, the following additional aims have been defined:

- to examine the frequency of implementing orienteering or some of its content which has been adapted for teaching,
- to examine Physical Education and Geography teachers' implementation of orienteering activities,
- to examine the self-assessment of Physical Education and Geography teachers' competence for the implementation of orienteering,
- to examine Physical Education and Geography teachers' attitudes pertaining to the possibility of incorporating orienteering in the school and subject plans and programmes,
- to examine the teachers' attitudes about a possible role of orienteering in encouraging cross-curricular teaching of Geography and Physical Education.

In accordance with the set research aims, the following hypotheses have been proposed:

H1: The frequency of implementing orienteering or some of its content adapted for teaching, and the percentage of teachers participating in its implementation is small.

H2: Teachers' self-assessment of competence for the implementation of orienteering is satisfactory.

H3: Participants' attitudes towards implementing orienteering in school and subject curricula are positive.

H4: Research participants do not differ significantly according to the frequency of implementation, the level of competence and attitudes towards orienteering as observed on the basis of gender, type of school, school location and group belonging.

Methodology

Participants

The sample consisted of a total of 146 participants, of which 109 Geography teachers (hereinafter: geographers) and 37 Physical Education teachers (hereinafter: kinesiologists), whose data are shown in Table 3. Differences in the number of surveyed teachers resulted from the fact that geographers were surveyed at a meeting

that was part of their compulsory training (which took place in one day), while the survey of the kinesiologists was performed mostly individually over a longer period of time. It was determined that the sample of participants was composed predominantly of female teachers with the ratio of 101: 45. This is particularly evident in the geographers group, where the ratio was 83: 26 in favour of female teachers. In the group of kinesiologists, the number of male and female participants is almost identical 18:19. Most of the participants work in primary schools and in the cities. In addition, research participants have on average more than 20 years of work experience in school.

Table 3

Research participants

Participants	Total number	Male	Female	Primary school	Secondary school	City school	Rural school
Geographers	109	26	83	74	35	90	19
Kinesiologists	37	18	19	20	17	33	4
Total sample	146	45	101	94	52	123	14

Data Processing

The data processing was done in the Statistics 13.2 program. For research purposes, the elements of descriptive statistics were calculated, the normality of the distribution of results was verified, and the possible differences were checked by t - test and Mann Whitney U test.

The descriptive statistics elements presented in this paper are arithmetic mean (M), standard deviation (SD), Kolmogorov - Smirnov test (K - S) as an assessment of the significance of the normal distribution of results, t - test for independent samples used to assess the significance of the differences, and Mann Whitney U test, applied to calculate the significance of the differences.

Research Procedure and Instrument

The survey was conducted in the period from July 2017 to February 2018 on a sample covering most of the Republic of Croatia, with a focus on its central part, which is where the largest number of participants came from. For the purposes of the research, the participants filled in a survey questionnaire containing 15 questions, and constructed for this research. The first 5 questions relate to general information such as gender, work place, subject they are teaching, etc. The second group of questionnaire items (from 6 to 10) is related to orienteering, its implementation and related teacher competences. The implementation of orienteering topics in school plans and programmes and the two subject plans and programmes (Physical Education and Geography) as well as possibilities for cross-curricular teaching of the two subjects have been covered by the last set of variables (12 to 15).

Results

The results of the analysis of the basic descriptive indicators are presented in the tables as follows.

Table 4

Descriptive statistics for the whole sample (N = 146), geographers (N= 109) and kinesiologists (N= 37)

Variables	M	M	M	SD	SD	SD	K-S	K-S	K-S
	All	Geo	Kin	All	Geo	Kin	All	Geo	Kin
Gender	1.69	1.76	1.49	0.46	0.43	0.51	p < .01	p < .01	p < .01
School	1.36	1.32	1.46	0.48	0.47	0.51	p < .01	p < .01	p < .01
Work experience	2.16	2.13	2.27	1.06	1.05	1.10	p < .01	p < .01	p < .10
Place	1.22	1.24	1.16	0.54	0.56	0.50	p < .01	p < .01	p < .01
Subject	1.73	1.97	1.03	0.44	0.16	0.16	p < .01	p < .01	p < .01
The term of orienteering	1.00	1.00	1.00	0.00	0.00	0.00	p < .01	p < .01	p < .01
Implementation of orienteering	1.34	1.33	1.35	0.71	0.69	0.75	p < .01	p < .01	p < .01
Extracurricular activities	1.71	1.77	1.54	0.94	0.96	0.87	p < .01	p < .01	p < .01
The person implementing the activities	3.22	3.16	3.41	1.00	1.00	0.98	p < .01	p < .01	p < .01
Teacher competences	2.16	2.10	2.32	0.77	0.76	0.78	p < .01	p < .01	p < .01
Frequency of implementation	2.49	2.40	2.73	1.22	1.19	1.28	p < .01	p < .01	p < .01
Personal engagement	1.51	1.50	1.57	0.60	0.63	0.50	p < .01	p < .01	p < .01
Implementation in the school curriculum	4.02	4.06	3.92	0.75	0.70	0.86	p < .01	p < .01	p < .05
Implementation in the subject syllabus	3.85	3.84	3.86	0.92	0.92	0.92	p < .01	p < .01	p < .05
Correlation contribution	4.12	4.17	3.97	0.70	0.65	0.83	p < .01	p < .01	p < .01

Legend: arithmetic mean (M), standard deviation (SD), Kolmogorov - Smirnov test (K-S)

The displayed results can be observed through three segments. The first group consists of the aforementioned items referring to general data. The second group of variables describes the level of implementation of orienteering or similar activities in schools. Almost all respondents reported familiarity with the concept of orienteering (four respondents were not familiar with this concept, so their results were excluded from the analysis). Though the respondents reported familiarity with the concept of

orienteering, it is apparent from the presented results that the contents of orienteering adapted for teaching are implemented only in few schools either as part of a subject or as extracurricular or out-of-school activities. The obtained values of arithmetic means in the two groups - geographers and kinesiologists - are very similar to the results of the total sample. It may be observed that the group of kinesiologists expressed a somewhat greater competence and reported more frequent implementation of orienteering compared to geographers. The highest dispersion of results (according to standard deviation values) is evident in variables describing work experience, the person conducting orienteering, and the frequency of its implementation. The dispersion of results is understandable considering the nature of these items.

Kolmogorov - Smirnov test on the total sample as well as on the individual samples of geographers and kinesiologists shows that the distribution of results significantly deviates from normal distribution. The exception is work experience variable in the kinesiologists group, whose results follow normal distribution.

Table 5

The results of the t - test for independent samples based on gender, school level and school location on the whole sample of respondents

Variables	GENDER			SCHOOL LEVEL (primary-secondary)			SCHOOL LOCATION		
	t	df	p	t	df	p	t	df	p
Work experience	**2.85**	**144**	**0.01**	-1.2	144	0.22	**2.07**	**135**	**0.04**
Subject	**2.89**	**144**	**0.00**	1.6	144	0.11	0.14	135	0.89
The term of orienteering		144			144			135	
Conducting orienteering	0.03	144	0.98	-1.1	144	0.27	-0.16	135	0.87
Extracurricular activities	1.16	144	0.25	**3.4**	**144**	**0.00**	-1.37	135	0.17
The person implementing the activities	-0.92	144	0.36	**-2.4**	**144**	**0.02**	1.53	135	0.13
Teacher competences	-1.86	144	0.06	-0.9	144	0.39	-0.35	135	0.72
Frequency of implementation	-1.80	144	0.07	-0.4	144	0.70	-0.45	135	0.65
Personal engagement	-1.77	144	0.08	-1.5	144	0.13	1.42	135	0.16
Implementation in the school curriculum	0.46	144	0.65	-0.4	144	0.66	-0.45	135	0.65
Implementation in the subject syllabus	-0.35	144	0.73	-0.5	144	0.60	0.99	135	0.32
Correlation contribution	-0.19	144	0.85	1.3	144	0.21	**-2.85**	**135**	**0.01**
Group	**-3.22**	**144**	**0.00**	-1.5	144	0.13	1.02	135	0.31

Legend: t - test result (t), degrees of freedom (df), coefficient of the significance of differences (p)

The analysis of the difference in the results was expressed by the values of t - test and Mann Whitney U test. The results presented in Table 5 indicate statistically significant gender-based differences for items related to work experience and the subject taught by the teachers. The difference in these two items is self-evident, given their content,

so it may be concluded that for all other items (even those relevant specifically for this research) no gender-based statistically significant differences were found. Statistically significant differences were however observed according to whether teachers were working in primary or secondary school. The results indicate that significantly more orienteering contents are implemented in primary school as part of extracurricular activities. Significant difference was also confirmed for the variable that defines the person who teaches orienteering activities. In primary schools they are mostly implemented by external associates, while in secondary school, they are mostly not implemented.

Significant differences pertaining to the location of the school (city or rural) are visible in teachers' work experience and contribution to cross-curricular teaching. As far as work experience is concerned, teachers working in rural schools have significantly less working experience. Given the considerably smaller number of rural schools (14 compared to 123 city schools), it is possible that this caused a statistically significant difference for this item. The item that describes cross-curricular teaching of Geography and Physical Education has greater support in rural schools. This is understandable given that the natural environment in which rural schools exist probably provides a greater possibility for carrying out these contents in both subjects.

Table 6

The results of the t - test for independent samples based on gender for the sample of geographers (N = 109) and results of the Mann Whitney U test for the sample of kinesiologists (N = 37)

Variables	GEOGRAPHERS F = 83 M = 26					KINESIOLOGISTS F = 18; M = 19		
	M (F)	M (M)	t	df	p	U	Z	P
School	**1.27**	**1.50**	**-2.27**	**107**	**0.025**	120.50	1.52	0.13
Work experience	**2.24**	**1.77**	**2.04**	**107**	**0.044**	94.00	**2.32**	**0.02**
Place	1.25	1.19	0.48	107	0.631	135.00	-1.08	0.28
Subject	1.96	2.00	-0.98	107	0.330	161.50	0.27	0.78
The term of orienteering	1.00	1.00		107		171.00	-0.02	0.99
Conducting orienteering	1.29	1.46	-1.11	107	0.271	139.00	0.96	0.34
Extracurricular activities	1.84	1.54	1.42	107	0.158	150.00	-0.62	0.53
The person implementing the activities	3.13	3.23	-0.43	107	0.665	159.00	-0.35	0.73
Teacher competences	2.04	2.31	-1.61	107	0.111	162.00	-0.26	0.80
Frequency of implementation	2.33	2.65	-1.23	107	0.220	144.50	-0.79	0.43
Personal engagement	1.43	1.69	-1.84	107	0.069	167.00	-0.11	0.92
Implementation in the school curriculum	4.08	3.96	0.77	107	0.441	161.50	-0.27	0.78
Implementation in the subject syllabus	3.84	3.85	-0.01	107	0.989	157.00	-0.41	0.68
Correlation contribution	4.19	4.08	0.80	107	0.427	125.00	-1.38	0.17

Legend: arithmetic mean (M), t-test result (p), degrees of freedom (df), coefficient of the significance of differences (p), Mann Whitney U test result (U), standardized values (Z), coefficient of the significance of differences (p)

Based on the results shown in Table 6, significant gender-based differences in the group of geographers exist only according to the work place, with significantly more female teachers working in primary schools. Work experience is also significantly in favour of female teachers. This difference may be due to a greater number of female participants in the research compared to their male colleagues, and possibly would not have been extracted in a more balanced sample.

The group of kinesiologists who are, according to gender, almost evenly balanced differs only according to work experience, which is in favour of female Physical Education teachers.

Table 7

The results of the t-test for independent samples based on the school level for the sample of geographers (N = 109) and results of the Mann Whitney U test for the sample of kinesiologists (N = 37)

Variables	GEOGRAPHERS					KINESIOLOGISTS		
	M Primary school N= 74	M Secondary school N =35	t	df	p	U	Z	P
Work experience	2.07	2.26	-0.88	107	0.38	148.50	-0.64	0.52
Place	1.30	1.11	1.61	107	0.11	136.00	1.02	0.31
Subject	1.99	1.94	1.30	107	0.20	160.00	-0.29	0.77
The term of orienteering	1.00	1.00		107		170.00	0.02	0.99
Conducting orienteering	1.27	1.46	-1.32	107	0.19	167.50	0.06	0.95
Extracurricular activities	**1.93**	**1.43**	**2.63**	**107**	**0.01**	115.50	1.65	0.10
The person implementing the activities	3.05	3.37	-1.55	107	0.12	127.50	-1.28	0.20
Teacher competences	2.07	2.17	-0.67	107	0.51	164.00	-0.17	0.87
Frequency of implementation	2.38	2.46	-0.32	107	0.75	165.00	0.14	0.89
Personal engagement	1.42	1.66	-1.86	107	0.07	158.00	0.35	0.73
Implementation in the school curriculum	3.97	4.23	-1.79	107	0.08	133.00	1.11	0.27
Implementation in the subject syllabus	3.76	4.03	-1.44	107	0.15	129.00	1.23	0.22
Correlation contribution	4.16	4.17	-0.07	107	0.94	113.50	1.71	0.09

Legend: arithmetic mean (M), t-test result (p), degrees of freedom (df), coefficient of the significance of differences (p), Mann Whitney U test (U) result, standardized values (Z), coefficient of the significance of differences (p)

Results of the t-test, which was used to analyse the differences based on whether teachers work in primary or secondary school in the group of geographers, and the results of the Mann Whitney U test, which was used to analyse the differences in the group of kinesiologists, are presented in Table 7.

The results of the t-test comparing geographers and kinesiologists show significant differences only according to gender (in the group of geographers there is a significantly higher number of women), and the subject they teach.

Table 8

The results of the t - test for independent samples based on the group: geographers (N = 109) and kinesiologists (N = 37)

Variables	M GEO	M KIN	t	df	p	N GEO	N KIN
Gender	**1.76**	**1.49**	**3.22**	**144**	**0.00**	**109**	**37**
School	1.32	1.46	-1.52	144	0.13	109	37
Work experience	2.13	2.27	-0.70	144	0.48	109	37
Place	1.24	1.16	0.74	144	0.46	109	37
Subject	**1.97**	**1.03**	**30.23**	**144**	**0.00**	**109**	**37**
The term of orienteering	1.00	1.00		144		109	37
Conducting orienteering	1.33	1.35	-0.16	144	0.88	109	37
Extracurricular activities	1.77	1.54	1.29	144	0.20	109	37
The person implementing the activities	3.16	3.41	-1.31	144	0.19	109	37
Teacher competences	2.10	2.32	-1.54	144	0.13	109	37
Frequency of implementation	2.40	2.73	-1.41	144	0.16	109	37
Personal engagement	1.50	1.57	-0.63	144	0.53	109	37
Implementation in school curriculum	4.06	3.92	0.96	144	0.34	109	37
Implementation in the subject curriculum	3.84	3.86	-0.12	144	0.91	109	37
Correlation contribution	4.17	3.97	1.45	144	0.15	109	37

Legend: arithmetic mean (M), t-test result (t), degrees of freedom (df), coefficient of the significance of differences (p)

Discussion

The results presented in Table 4 are consistent with the first hypothesis (H1), which assumes that the frequency of implementing orienteering or some of its content adapted for teaching, and the percentage of teachers participating in its implementation is small, and therefore H1 can be accepted. If some of these activities are performed, it is mostly done by external associates, which is understandable based on the presented results indicating that teachers are mostly not certain of their own competence in implementing them. Accordingly, teachers' personal engagement in the implementation of orienteering activities is small. The results of this study have showed teachers' insecurity regarding their own competence, which is why the second hypothesis (H2) is rejected, as it proposed that self-assessment of competence for the implementation of orienteering is satisfactory for a large number of respondents.

Based on the obtained values, the last group of items describes research participants' attitudes regarding possible benefits of including orienteering in the school and subject curricula, and the cross-curricular contribution to the mentioned subjects. The values of these items are high, and such positive attitude towards the inclusion of orienteering in the school and subject curriculum fully confirms the third hypothesis (H3), but also shows that there is space for including these contents with a view of modernizing the teaching process by introducing content directed towards teaching

outside the classroom.

Values of arithmetic means in the group of geographers and kinesiologists are very similar to the results of the total sample. It may be noticed that the group of kinesiologists expressed somewhat higher competence and more frequent implementation of orienteering in comparison to geographers. The highest dispersion of results (according to standard deviation values) is seen in variables describing work experience, the person who is conducting orienteering, and frequency of its implementation. Dispersion of the results is understandable considering the nature of these items.

The analysis of differences has indicated significant gender-based differences between geographers and kinesiologists only by external factors (which may not always be influenced). Therefore, it can be said that the fourth hypothesis (H4) has been confirmed, indicating that research participants do not differ significantly in the frequency of implementation, level of competence and attitudes towards orienteering (Table 6).

According to the place of work (primary or secondary school) the group of geographers differs significantly only in the variable that defines the representation of the elements of orienteering in extracurricular activities (Table 7). Significant difference was confirmed in favour of primary school geographers, who are not certain if this extracurricular activity is conducted, as opposed to their secondary school colleagues, who are closer to the belief that it is not implemented at all. In the group of kinesiologists no significant differences were found regarding work in primary or secondary school for none of the variables. It is possible that the results in the group of geographers may have been different, i.e. that there would be no significant differences if the sample of geographers were more balanced, considering that there was a significantly higher number of those working in primary schools (74:35) unlike kinesiologists whose numbers did not differ significantly (20:17).

Since t-test results between geographers and kinesiologists (Table 8) showed significant differences only by gender and subject they are teaching, it can be said that these two groups have more similarities than differences. Accordingly, the fourth hypothesis (H4), according to which research participants do not significantly differ in the frequency of implementation, the level of competence and attitudes towards orienteering, was also confirmed.

Conclusion

The arguments put forward should contribute to the incorporation of orienteering into Croatian primary and secondary school curricula. Although in Physical Education, orienteering can be implemented through several grades of primary school and during secondary school, from the point of view of Geography for the same activity, 5th and 8th grades are more appropriate, because during these grades the contents of orienteering and movement with the help of plan or topographic map are taught. More frequent

implementation of orienteering in teaching would certainly contribute not only to better correlation of the two subjects and cross-curricular teaching, but also to more work outside the classroom and modernization of the entire teaching process.

The results obtained in this research lend themselves to the following conclusions:

- the frequency of implementing orienteering or some of its content adapted for teaching in Croatian schools is small, thus confirming the first hypothesis (H1),
- the participants of this research showed insecurity regarding their competences, whereby the second hypothesis (H2), which proposed that teachers' self-assessment of competences for the implementation of orienteering is satisfactory for the majority of respondents, was not confirmed.
- a positive attitude of the research participants was expressed toward the inclusion of orienteering in the school and subject curriculum, thus confirming the third hypothesis (H3).
- Geography and Physical Education teachers do not differ significantly according to the frequency of implementation, the level of competence and attitudes towards orienteering. In most of the items, no statistically significant differences were observed according to gender, type of school or school location, which confirmed the fourth hypothesis (H4).

Based on everything presented, it can be said that Geography and Physical Education teachers are acquainted with orienteering, they recognize its potential and express positive attitudes about its incorporation in school and subject curricula. Nevertheless, orienteering contents are rarely or not at all carried out in primary schools, and even less so in secondary schools. The reasons may be sought in the fact that orienteering is still not included in the curricula, in the complex preparations for its implementation, as well as the lack of competences of the teachers of the two subjects.

In order to obtain credible results on the analysed contents of this paper, future research should certainly include a larger number of kinesiologists and should balance the sample of geographers according to the basic criteria in order to make the results more credible and to show more realistic attitudes that are not conditioned by possible imbalances within the group.

References

Action Centered Training. *Treasure Hunt*. Retrieved from http://www.corporateteambuilding.com

Adventure Sport. *Osnovan Hrvatski savez za orijentacijsko trčanje*. Retrieved from http://www.adventure-sport.net/Zemlja/Orjentacijsko-trcanje/Osnovan-Hrvatski-savez-za-orijentacijsko-trcanje.html

Baker, J. (2003). O Integrated into Entire Curriculum. *Orienteering North America*, February/March. Retrieved from http://www.ocin.org/school/IntegEd.pdf

Chun-xia, C. (2005). Study on the Effects of Orienteering on the Middle School Students' Mental Health [J]. *Fujian Sports Science and Technology*, 2, 7-19.

Daschiel, A., Döhler, U., Roche, J., & Zangerl, M. (2012). *Orientierungslauf für die Schule: Von den Basics bis zum Lauf im Gelände – Orientierungs auf gaben und Aus dauer training mit Spaß!* München: AuerVerlag.

Galan, Y., Zoriy, Y., Briskin, Y., & Pityn, M. (2016). Orienteering to optimize the psychophysical wellbeing of young teens (13 to 14-year-old). *Journal of Physical Education and Sport*, *16*(3), 914-920.

Gobec, I., & Gobec, D. (2003). *Orijentacijsko trčanje*. Zagreb: Planinarski savez Zagreba.

Goncharova, N. N., & Butenko, H. A. (2015). Substantiation and working out of recreation health related technology on the basis of health related hiking and orienteering for junior school age children. *Pedagogics, psychology, medical biological problems of physical training and sports*, *11*, 6-33. https://doi.org/10.15561/18189172.2015.1104

Hnilica, T., & Hnilica, S. (2001). *Orientierung slaufinder Schule*. Retrieved from http://www.oefol.at/intern/kommissionen/ausbildung/skripten/schul_ol_grundlagen.pdf

ISB (Staatsinstitut für Schulqualität und Bildungsforschung). (2000). *Lehrplan für die bayerische Grundschule*. München: ISB.

ISB (Staatsinstitut für Schulqualität und Bildungsforschung). (2009). *Lehrplan für das Gymnasium in Bayern*. München: ISB.

Jelić, T. (2001). *Zemljopis 4: metodički priručnik zemljopisa za 8. razred osnovne* škole. Zagreb: Alfa.

Jelić, T. (2002). *Zemljopis 1: metodički priručnik zemljopisa za 5. razred osnovne* škole. Zagreb: Alfa.

Jenko, S. (2008). Primjena orijentacijskog trčanja u nastavi tjelesne i zdravstvene kulture. In B. Neljak (Ed.), *Conference proceedings "17. ljetne škola kineziologa Republike Hrvatske 'Stanje i perspektiva razvoja u područjima edukacije, sporta, sportske rekreacije i kineziterapije'"* (pp. 514-516). Poreč - Zagreb: Hrvatski kineziološki savez.

Jourand, C., Adé, D., Carole, S., Komar, J., & Thouvarecq, R. (2017). Dynamics of student interactions: an empirical study of orienteering lessons in physical education. *Physical Education and Sport Pedagogy*, *23*(2) 1-16. https://doi.org/10.1080/17408989.2017.1342790

Kjellström, B. (1976). *Be expert with map & compass: The complete "orienteering" handbook*. New York: Scribner.

Lorger, M., & Braičić, Z. (2014). Orijentacijsko kretanje (trčanje) u nastavi nižih razreda osnovne škole – primjer interdisciplinarnosti Tjelesne i zdravstvene kulture i Prirode i društva. *Napredak*, *155*(4), 435-451.

Mayorkina, I. (2015). Means of Orienteering in Education of Junior School Children with Intellectual Disability. *The Education and Science Journal*, *7*(126), 152-164. https://doi.org/10.17853/1994-5639-2015-7-152-164

McNeill, C., Wright, J. C., & Renfrew, T. (1998). *Teaching Orienteering*. Champaign, IL: Human Kinetics.

Mihelčić, N. (2015). Orientacijski tek in odkrivanje okolice: interdisciplinarno povezovanje. *Metodički obzori: časopis za odgojno-obrazovnu teoriju i praksu*, *10*(2), 89-100. Retrieved from https://hrcak.srce.hr/154233

MZO (Ministarstvo znanosti i obrazovanja). (2006). *Nastavni plan i program za osnovnu školu*. Zagreb: MZOŠ.

Obad, M. (1997). Orijentacija u prostoru. *Radovi Filozofskog fakulteta Zadar*, *36*, 271-278. https://doi.org/10.15291/radovifpsp.2692

Seiler, R. (1996). Cognitive Processes in Orienteering – A Review. *Scientific Journal of Orienteering*, *2*(12), 50-65.

Tammaro, R., D'Alessio, A., & Petolicchio, A. (2017). Orienteering: motivation, multidisciplinary and skills. A project in a secondary school in the province of Salerno. *International Journal of Humanities and Social Sciences*, *9*(5), 34-40.

Trkulja Petković, D., Podvalej, L., & Širić, V. (2009). Mogućnosti provedbe nekih planinarskih aktivnosti u primijenjenoj kineziologiji. In B. Neljak (Ed.), *Conference proceedings* "*18. ljetne škole kineziologa Republike Hrvatske - Metodički organizacijski oblici rada u područjima edukacije, sporta, sportske rekreacije i kineziterapije*" (pp. 501-507). Zagreb: Hrvatski kineziološki savez.

Vukadinović, N., Juhas, I., & Kozoderović, J. (2015). Orijentiring sekcija kao oblik vančasovne aktivnosti u fizičkom vaspitanju. *Fizička kultura*, *69*(1), 59-69. https://doi.org/10.5937/fizkul1501059V

Zentai, L. (2014). Implementation of Cartographic and Digital Techniques in Orienteering Maps. In M. Buchroithner, N. Prechtel, & D. Burghardt (Eds.), *Cartography from Pole to Pole: Selected Contributions to the XXVIth International Conference of the ICA, Dresden, 2013* (pp. 19-29). Berlin Heidelberg: Springer-Verlag.

Zhang, M., Jan, Z., Zhao, C., & Huang, H. (2001). Effects of Orienteering Program on the Physical Fitness of Middle School Students. *Journal of Xi'an Physical Education University*, 2, 11-22.

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Orijentacijsko trčanje u funkciji interdisciplinarnosti u nastavi: stanje i perspektive

Sažetak

Orijentaciju kao sportsko-natjecateljsku, rekreacijsku ili edukacijsku aktivnost sve učestalije provode različite sportske udruge, planinari i drugi rekreativci. U njezinu provođenju sudjeluju i učitelji i nastavnici u školama, naročito u onima koje su uključene u GLOBE program. Cilj rada bio je ispitati uključenost orijentacijskog trčanja ili nekih njegovih sadržaja u programe rada škola i predmeta u višim razredima osnovne škole i u srednjim školama u Republici Hrvatskoj, kao i moguću ulogu orijentacijskog trčanja u poticanju interdisciplinarnosti u nastavi. Zbog želje za upotpunjavanjem nastavnih metoda i oblika rada većom količinom rada izvan učionice, svrha rada jest pridonijeti oblikovanju argumentiranog zahtjeva za ugrađivanjem orijentacijskog trčanja u kurikul osnovne škole u Hrvatskoj. Budući da je orijentacijsko trčanje naročito značajno s gledišta nastave Geografije i Tjelesne i zdravstvene kulture, radi identificiranja njihovih korelacijskih veza analizirani su postojeći nastavni programi dvaju predmeta. U radu se iznose i rezultati istraživanja provedenog 2017. i 2018. godine na uzorku od 146 učitelja i nastavnika Geografije i Tjelesne i zdravstvene kulture iz Hrvatske. Rezultati ukazuju na to da su učitelji upoznati s tom aktivnošću pa iako prepoznaju njezin potencijal u smislu želje za njezinom ugradnjom u planove i programe rada, kao i doprinos međupredmetnoj korelaciji, sadržaji orijentacijskog trčanja vrlo se rijetko ili uopće ne provode u osnovnim, a još manje u srednjim školama. Rezultati ovog istraživanja također su ukazali na nedostatak kompetencija učitelja i nastavnika i njihovo nesnalaženje u tom području.

Ključne riječi: *Geografija; korelacija, orijentacija, rad izvan učionice, Tjelesna i zdravstvena kultura.*