

THE ROLE AND IMPORTANCE OF OUTDOOR TEACHING AND FIELDWORK IN BIOLOGY FOR PRIMARY SCHOOL TEACHER EDUCATION

izv. prof. dr. sc. Irella Bogut
Sveučilište Josipa Jurja Strossmayera u Osijeku
Fakultet za odgojne i obrazovne znanosti
Osijek, Hrvatska

mr. sc. Željko Popović
Sveučilište Josipa Jurja Strossmayera u Osijeku
Fakultet za odgojne i obrazovne znanosti
Osijek, Hrvatska

doc. dr. sc. Alma Mikuška
Sveučilište Josipa Jurja Strossmayera u Osijeku
Odjel za biologiju
Osijek, Hrvatska

Abstract:

The importance of outdoor activities and fieldwork in biology teaching is well known and presented in the faculty curriculum for biology teachers. The value of first-hand experience of the natural environment through the outdoor learning, for both biology teachers and their students, is evident in a wide range of published studies. Observation of the environment and its changes, as well as practical research during the fieldwork, are also crucial for the students of Primary school teachers studies (Faculty of Education) to understand the nature and to be aware of the human impacts on the world. The education of primary school teachers for the outdoor teaching and the fieldwork is very important in today's society, when children are more focused on indoor activities, mostly due to the technology development (television, video games, and the internet). Our previous research showed that students, and teachers of Primary school education studies have poor knowledge of common plants and animals, even from their close surroundings. There is no comprehensive information about the extent of the fieldwork teaching in biology, as a part of the curriculum for primary school teachers on Faculties of Education in Croatia. We are presenting comparison of existing plans and programs for primary school teachers in Croatia as a starting point for a much complex research on this very important educational issue in the school teacher's education. We also present some of our experiences in the organization of the outdoor teaching and fieldwork in biology, for students of Primary school teacher study program, as part of the curriculum of the Faculty of Education of the Josip Juraj Strossmayer University of Osijek.

Key words: outdoor education, fieldwork, biology, primary school teachers

INTRODUCTION

Fieldwork, which can be defined as any curriculum component that involves leaving the classroom and engaging in teaching and learning activities through first-hand experience of outdoor phenomena, has a long tradition in the biology and environmental science/studies. It brings conceptual, cognitive, organisation and social gains, much of which would be lost without the particular opportunities the fieldwork provides. The fieldwork demands an application of thinking processes which are very difficult to recreate in the classroom. The fieldwork provides an opportunity for teachers to have a different, more positive and productive relationship with their students. It involves students working together to interact and derive exchange of

knowledge, experience and conclusions. The interrelationships developed whilst working in groups can have a huge influence on how students develop socially (Barker et al. 2002). There is a clear evidence in different areas of education that combining different teaching and learning approaches – including differentiated learning, which characterizes much outdoor teaching and field work teaching – benefits all students in the class. It also helps to motivate and inspire children who may otherwise be side-lined by a more formal classroom situation (Nundy, 2001). The fieldwork in the natural sciences, can help to put the enjoyment back into a content dominated curriculum, because students can observe animals and plants in their real habitats – (Nundy, 2001). According to Nundy 2001 there are three major benefits of fieldwork:

- a positive impact on long-term memory due to the memorable nature of the fieldwork setting
- affective benefits of the residential experience, such as individual growth and improvements in social skills
- reinforcement between the affective and the cognitive, with each influencing the other and providing a bridge to higher order learning.

Nundy (1999a) specifically looked at a residential fieldwork for primary school students. He reported that improvements in the affective domain can lead to the improvements in cognitive outcomes. Nundy wrote that: *Residential fieldwork is capable not only of generating positive cognitive and affective learning amongst students, but this may be enhanced significantly compared to that achievable within a classroom environment* (Nundy, 1999b).

There is a lot of evidence in the published literature which indicates that a fieldwork, properly performed, and adequately planned, can offer students opportunity to develop the knowledge and skills that can add value to their experiences in the classroom (Rickinson et al. 2004).

In a wide range of published studies, the importance of the first-hand experience in the natural habitats can be seen, particularly for the teaching of biology (Killerman, 1996; Manzanal, et al., 1999; Magntorn and Hellden, 2007; Hamilton-Eekeke, 2007).

In Croatia, the term "outdoor teaching", as a pedagogical term, can be found in the recent pedagogical literature. While in the history, the outdoor teaching referred to as the "practical exercises in teaching" and "exercising". The significance of practical class as an important component in the structure of the teaching process was emphasized by Vladimir Poljak in the middle of the 20th century (De Zan, 1999.).

The importance of outdoor and fieldwork teaching in biology is well known and presented in the faculty curriculum for biology teachers (Popović 1998). Also, the effectiveness of a fieldwork in the primary school, in higher grades (5th to 8th grade), was analysed (Lukša et al. 2014). Lukša et al. (2014), concluded that the students are happy to accept the fieldwork as a form of learning the new content of a subject, and consider that in a form of work they learn much more. These results are in line with the argument that such teaching is pedagogically more effective, and interesting, in the term of goals of the contemporary education (De Zan, 1999). The teacher's confidence is one of the main predispositions towards the outdoor teaching and fieldwork (Graham et al 2015), and in a survey of Lukša et al. (2014), teachers considered that they are well-educated for this type of teaching.

There is no comprehensive information about the extent of the fieldwork teaching in biology as a part of the curriculum for primary school teachers on different Faculties of Education in Croatia. Observation of the environment and its changes, as well as practical research during the fieldwork, are also crucial for the students of primary school teachers study program of Faculty of Education, to understand the nature and to be aware of the human impacts on the world. The education of primary school teachers for the outdoor teaching and fieldwork is very important in today's society when children are more focused on indoor acti-

vities, mostly due to the technology development (television, video games, and the internet). Our previous research showed that pupils, and students of primary school education, have poor knowledge of the common plants and animals, even from their close environment. For example, we tested student's knowledge (third and fourth grade of primary school and first year of teaching studies) about trees and shrubs from their close surroundings. The analysis of the results showed that there was no significant difference in knowledge of the forest trees and shrubs between pupils and students, what was quite unexpected (Popović et al. 2016). In another study, we tested pupils of the fourth grade of primary school and students of the third year of teaching studies at the Faculty of Educational Sciences in Osijek, for the knowledge on local lowland wildlife (the game). Pupils provided 43% and students only 53% correct answers. On average, pupils can name only six and students only eight names of the common game animals that live in their surroundings (Jurčević Agić et al. 2015). The results are indicative and can be used in favour of the justified criticism of the educational system, but also as an incentive for more responsible work of the primary school teachers and to improve their own knowledge about the common animal and plant species from their surroundings.

COMPARISON OF THE PROGRAMS FOR PRIMARY SCHOOL TEACHERS IN CROATIA

We compared all programs of Integrated undergraduate and graduate university teacher studies in Croatia regarding to courses that are lecturing biology and biology related subjects (Table 1). All programs are available on the universities' web pages. From this comparison we can conclude that:

- 1) Number of courses is different
- 2) Number of mandatory and elective courses is different
- 3) Number of hours in same courses (e.g. Natural science) is different
- 4) Fieldwork as obligatory course is only represented in program of integrated undergraduate and graduate teacher studies of Faculty of Education in Osijek
- 5) Outdoor teaching in biology is represented in Faculty of Humanities and Social Sciences in Split as a part "Outdoor teaching in nature and social sciences" and it is elective course

In the personal communication with the lecturers from other universities and in the analyses of courses syllabus, we gathered the information that the fieldwork is incorporated as part of the mandatory courses in Biology (Natural science). Problem is that the hours of practices and seminars in the courses are not sufficient to organize a fieldwork and the outdoor teaching (*pers. comm*).

There is no survey data in Croatia which show the attitudes of students of primary school education and their professors about the Fieldwork as an obligatory course in their program of education. We are planning to carry out a survey, to collect the data that will show to what extent are students and teachers of primary school education in Croatia interested in the introduction of the Fieldwork as a part of their education curriculum. We are planning to organize questionnaire for the students and the professors at the Integrated undergraduate and graduate university teacher studies in Croatia. Also, we will organize questionnaire for students of the Faculty of Education in Osijek, to analyse their attitudes about the value of the Fieldwork as an obligatory course in their education. All the questionnaire will be standardised, and results will be statistical analysed. The results will be discussed and can be valuable for further steps in the improvement of the quality of teacher studies in Croatia.

Table 1. Comparison of programs for primary school teachers in Croatia

University	Osijek ¹ (Slavonski Brod)	Pula ²	Rijeka ³	Split ⁴	Zagreb (Čakovec, Petrinja) ⁵	Zadar (Gospić) ⁶
Programme	Integrated undergraduate and graduate university teacher studies			Integrated undergraduate and graduate study programme Teacher Education	Integrated undergraduate and graduate university teacher studies	Integrated undergraduate and graduate university teacher studies
MANDATORY COURSES	Natural science I (30h)	Natural science (60h)	Natural science (45h)	Natural science (75h)	Natural science I (30h)	Natural science (45h)
	Natural science II (30h)	Ecology basic (30h)			Natural science II (45h)	
	Fieldwork (30h)				Natural science III (30h)	
	Ecology (30h)				Natural science IV (30h)	
ELECTIVE COURSES	Learning about plants and animals (30h)			Growing herbs (30h)		Ecology (30h)
				Research in natural science (45h)		
				Outdoor teaching in nature and social sciences (30h)		

DESCRIPTION OF THE FIELDWORK COURSE AT THE FACULTY OF EDUCATION IN OSIJEK

The syllabus of the Fieldwork course is closely linked with the syllabus of the Natural Sciences I and II. Through the acquisition of selected contents from syllabus of course in the excursion-oriented teaching, students prepare to observe, recognize and understand certain organisms and natural occurrences that are essential for the teaching vocation. Mastering these contents, in their natural environment, ensures the excellent perceptive, practical and thinking activities needed for the future independent work as teachers (e.g. school in nature, school garden, living corner, etc.).

Students under teacher's supervision are acquainted with the biocoenoses of forests, meadows, swamps, rivers, mountains and other characteristic regions in Croatia. Some of the activities that are performed within the course are: learning about the characteristic kinds of plants and animals belonging to different communities; identification of some protected plant and animal species, making herbariums of higher plants and algae; learning about mushrooms; collecting and preparation of insects; measuring physical and chemical parameters in different habitats (basic meteorological measuring); collecting materials for the living corner in a school;

familiarizing with the land cultivation and forest production; recognition of the level of degradation of certain biocoenoses; insight into landscape diversity. During several days excursion, students visit a well-organized country farm, school garden, botanical garden, zoo or aquarium; museum of natural sciences and some protected areas in Croatia.

The programme of this course is not tied to the weekly timetable. It is carried out in form of shorter half day teaching excursions and several-day teaching excursions. Fieldwork is carried out through demonstrations, searching, spotting, recognizing, independent measuring, recording, species identification, preparation, etc. For this type of teaching, it is necessary to provide transportation and accommodation for the students, as well as the necessary measuring instruments, tools and equipment. This can sometimes be a problem, so field stations and houses can help in solving the accommodation problems.

We presented in several studies the importance and the necessity of a fieldwork in nature for the primary school teacher education (Popović, 1999, 2004; Popović et al. 2007, 2008, 2009). Our experience, is that the students were highly motivated for work and cooperation, and that the mastering contents of the fieldwork course ensures the excellent perceptive, practical and thinking activities needed for future independent work as teachers (e.g. school in nature, school garden, living corner, etc.).

CONCLUSION

Knowing the great importance of a fieldwork for both students and primary school teachers, our further research activities will include studying and comparing programs, and experiences, in several other European countries. Our recommendation is that the Fieldwork should be introduced as an obligatory course in all programs for primary school teachers in Croatia. Well "trained" teacher has a high self-confidence to organize fieldwork and an outdoor teaching, what benefits the pupils. This is especially important in today's society when pupils are more focused on indoor activities.

REFERENCES

- Barker, S., Slingsby, D. & Tilling, S. (2002). Teaching biology outside the classroom. Is it heading for extinction? A report on biology fieldwork in the 14-19 curriculum. Based on discussions from a focus group meeting held at Malham Tarn Field Study Centre, North Yorkshire, May 2002, jointly sponsored by the Field Studies Council and the British Ecological Society.
- De Zan, I. (1999). *Metodika nastave prirode i društva*. Zagreb: Školska knjiga.
- Hamilton-Eekeke J. (2007). Relative effectiveness of expository and field study methods of teaching on students' achievement in ecology. *International Journal of Science Education*. 20, 15, 1869-1889
- Graham, W.S., Boyd M., Scott, L. & Colquhoun, D. (2015). Barriers to Biological Fieldwork: What Really Prevents Teaching Out of Doors? *Journal of Biological Education* Volume 49 (2) 165-178.
- Jurčević Agić, I., Bogut, I., Užarević, Z., Radić, M. & Popović, Ž. (2015). Poznavanje divljači nizinskog zavičaja kod djece mlađe školske dobi. Zbornik sažetaka 4. Simpozija s međunarodnim sudjelovanjem. Kopački rit-Jučer, danas, sutra Eds (Rožac, V., Bolšec, B., Kučera S., Tot Forjan R.) JU Park prirode "Kopački rit" Lug
- Killerman, W. (1996). Biology education in Germany: research into the effectiveness of different teaching methods. *International Journal of Science Education*, 18 (3), 333-346.
- Lukša, Ž., Žamarija, M., Dragić Runjak, T. & Sinković, N. (2014). Terenska nastava prirode i biologije u osnovnoj školi. *Educatio Biologie*, 1:69-79.
- Lock, R. (2010). Biology fieldwork in schools and colleges in the UK: an analysis of empirical research from 1963 to 2009. *Journal of Biological Education*, 44 (2), 58-64.

- Magntorn, O. & Hellden, G. (2007) Reading new environments: students' ability to generalize their understandings between different ecosystems. *International Journal of Science Education*, 29 (1), 67-100.
- Manzanal, R., Barreiro, L. & Jimenez, M. (1999). Relationship between ecology fieldwork and student attitudes toward environmental protection. *Journal of Research in Science Teaching*. 36 (4), 431 -453.
- Nundy, S. (1999a). 'The fieldwork effect: the role and impact of fieldwork in the upper primary school'. *International Research in Geographical and Environmental Education*, 8 (2), 190-8.
- Nundy, S. (1999b). 'Thoughts from the field: in their own words'. *Horizons*, 4, 20-22.
- Nundy, S. (2001). Raising achievement through the environment: a case for fieldwork and field centers. National Association of Field Studies Officers, Peterborough.
- Popović, Ž. (1988) Vrednovanje terenskog rada studenata biologije i kemije. Zbornik radova s međunarodnog znanstvenog skupa. Eds. (Peko A, Vodopija I.) Pedagoški fakultet. Sveučilište Josipa Jurja Strossmayera Osijek.
- Popović, Ž. (1999). Terenska nastava na učiteljskom studiju. Zbornik radova znanstvenog skupa "125 godina poslije", Ur: M. Matas i H. Vrgoč, Hrvatski pedagoško književni zbor, Zagreb i Visoka učiteljska škola, Petrinja, 62-65.
- Popović, Ž. (2004). Prirodoslovlje u školovanju učitelja u Osijeku. U: Učiteljska škola u Osijeku. Ravnatelj, profesori i maturanti 1893.-1965. Urednici: J. Martinčić i D. Hackenberger. Hrvatska akademija znanosti i umjetnosti, Zavod za znanstveni i umjetnički rad, Zagreb - Osijek, 65-70.
- Popović, Ž., Števančić-Pavelić, M., Kišmartin, I, Labavić, M. (2007). Učitelj i izvanškolske aktivnosti djece iz prirodoslovlja na ljetovanju. Zbornik radova znanstvenog skupa "Kompetencije i kompetentnost učitelja", Ur.: N. Babić, Učiteljski fakultet u Osijeku, Hrvatska i Kerson State University Kherson, Ukraine, Osijek, 18. i 19. 4. 2007., 353-359.
- Popović, Ž., Bogut, I. & Borić, E. (2008). Bolonjski proces i prirodoslovni predmeti na Učiteljskom fakultetu u Osijeku. / Bologna process and nature and science subjects on Faculty of Teacher Education in Osijek. Budućnost obrazovanja učitelja. / Future perspectives of primary school teacher training. Program i zbornik rezimea. / Program and abstracts. Učiteljski fakultet na mađarskom jeziku, Subotica, 18.-20. 9.2008. Str. 73.
- Popović, Ž., Bogut, I., Užarević, Z. & Medica, I. (2009). Nužnost terenske nastave iz prirodoslovlja na učiteljskom studiju. The necessity of field work in nature and science at the primary school teacher education. U: N. Vijić, Ž. Šiljković, (ur.), Edukacija prirodoslovlja, geografije i povijesti za društvo znanja. 3. međunarodna konferencija o naprednim i sustavnim istraživanjima, ECNSI, 16, Zadar.
- Popović, Ž., Bogut, I. & Kristić, K. (2016). Poznavanje drveća i grmlja učenika mlađe školske dobi i studenata učiteljskog studija. Zbornik sažetaka 5. Simpozija s međunarodnim sudjelovanjem. Kopački rit - Jučer, danas, sutra. Eds (Ozimec, S.; Bogut, I.; Rožac, V., Bolšec, B., Kučera S., Popović Ž.) JU Park prirode "Kopački rit" Lug.
- Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M. Y., Sanders, D. & Benefield, P. (2004). A Review of Research on Outdoor Learning. Preston Montford, Shropshire: Field Studies Council. Unknown Publisher.

Uloga i važnost izvanučioničnog učenja i terenske nastave u obrazovanju učitelja razredne nastave

Sažetak: Važnost izvanučioničke i terenske nastave u biologiji dobro je poznata i nalazi se u programu studija za nastavnike biologije. Vrijednosti iskustvenog učenja u neposrednoj prirodi kako za učenike tako i za nastavnike prikazana je u brojnim dosadašnjim istraživanjima. Promatranja okoliša i promjena u prirodi, kao i praktična istraživanja tijekom terenskog rada, ključni su i za studente učiteljskog studija Fakulteta za odgojne i obrazovne znanosti kako bi bilje razumijevali prirodne pojave i postali svjesni utjecaja čovjeka na prirodu. Obrazovanje učitelja osnovnih škola za izvanučioničku nastavu vrlo je važno u današnjem društvu kada su djeca više usmjerena na aktivnosti u zatvorenom prostoru, uglavnom zbog razvoja tehnologije (televizije, video igara i interneta). Naša dosadašnja istraživanja pokazala su da učenici i učitelji u osnovnim školama imaju skromno znanje o čestim biljnim i životinjskim vrstama, pa čak i onima iz vlastitog okruženja. Nema opsežnijih istraživanja o načinu provođenja i opsegu izvođenja terenskog rada u nastavi prirodoslovlja na studijima za obrazovanje učitelja razredne nastave u Hrvatskoj. U ovom radu smo usporedili postojeće planove i programe studija za učitelje osnovnih škola u Hrvatskoj, i predstavili plan za kompleksnije istraživanje ove važne teme u obrazovanju učitelja. Prikazali smo i neka vlastita iskustva u organiziranju terenske nastave iz prirodoslovlja za studente učiteljskog studija Fakulteta za odgojne i obrazovne znanosti Sveučilišta Josipa Jurja Strossmayera u Osijeku.

Ključne riječi: izvanučionička nastava, terenska nastava, biologija, učitelji razredne nastave

Rolle und Bedeutung des außerschulischen Unterrichts und des Unterrichts in der Natur in der Ausbildung der Lehrer der Primarstufe

Zusammenfassung: Die Bedeutung des Unterrichts außerhalb des Klassenzimmers und in der Natur im Biologieunterricht ist gut bekannt und im Studienprogramm für Biologielehrer fest verankert. Vorteile der unmittelbaren individuellen Lernerfahrung in der Natur, sowohl für Schüler als auch für Lehrer, sind in den zahlreichen bisherigen Untersuchungen dargestellt worden. Die Beobachtungen der Umwelt und der Veränderungen in der Natur sowie praktische Untersuchungen während des Unterrichts in der Natur sind auch für Lehramtstudenten der Fakultät für Bildungswissenschaften von grundlegender Bedeutung, damit sie die Naturerscheinungen besser zu verstehen lernen und sich der menschlichen Einwirkung auf die Natur bewußt werden. Die Ausbildung der Grundschullehrer für den Unterricht außerhalb des Klassenzimmers ist in der heutigen Gesellschaft besonders wichtig, wenn die Kinder vorwiegend auf Aktivitäten im geschlossenen Raum konzentriert sind, hauptsächlich wegen der Technologieentwicklung (Fernsehen, Videospiele, Internet). Unsere bisherigen Untersuchungen haben gezeigt, dass sowohl Schüler als auch Lehrer in der Grundschule über ganz bescheidene Kenntnisse über alltägliche Pflanzen- und Tierarten verfügen, sogar über diejenigen in der eigenen unmittelbaren Umgebung. Über die Art der Durchführung und über den Umfang des Unterrichts in der Natur im Naturkundeunterricht im Studium für die Ausbildung der Lehrer der Primarstufe gibt es keine umfangreichere Untersuchung. In dieser Arbeit haben wir die bestehenden Studienpläne und Studienprogramme für Grundschullehrer in Kroatien verglichen und einen Plan für eine komplexere Untersuchung dieses für die Lehrerausbildung wichtigen Themas vorgestellt. Wir haben auch eigene Erfahrungen bei der Organisation des Unterrichts in der Natur im naturkundlichen Unterricht für die Lehramtstudenten der Fakultät für Bildungswissenschaften an der Universität J. J. Strossmayer in Osijek präsentiert.

Schlüsselbegriffe: außerschulischer Unterricht, Unterricht in der Natur, Biologie, Lehrer der Primarstufe