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Educational outcomes from summer camps on conservation of freshwater ecosystems

Vzgojno-izobraževalni učinki poletnih taborov o ohranjanju ekosistemov celinskih voda

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Abstract: The purpose of this paper is to analyze the educational outcomes of different activities organized through summer camps concerning the conservation of freshwater ecosystems. The six-day duration camps were organised in three different locations across Slovenia. The camps were attended by 15 males and 27 females, aged 11 to 18 years. Educational outcomes were measured on the fifth and sixth day of each camp, using a combination of qualitative and quantitative methods. Results showed that participants greatly enjoyed attending the camps. The respondents reported that they learned much about freshwater ecosystems, fauna and flora, different research methods and handling research equipment. They also showed a high awareness and understanding of problems related to freshwater ecosystem conservation.

Keywords: outdoor education, camp, adolescents, awareness raising, freshwater ecosystem

Izvleček: Namen prispevka je analizirati rezultate vzgojno-izobraževalnih aktivnosti, ki so potekale na poletnih taborih o ohranjanju ekosistemov celinskih voda. Na treh lokacijah v Sloveniji so bili organizirani šestdnevni tabori. Taborov se je skupaj udeležilo 15 fantov in 27 deklet, starih med 11 in 18 let. Izobraževalni rezultati so bili merjeni kvalitativno in kvantitativno. Rezultati kažejo, da so udeleženci na taborih uživali. Menijo, da so se veliko naučili o ekosistemih celinskih voda, živalih in rastlinah, ter o različnih raziskovalnih metodah in opremi. Kažejo tudi visoko ozaveščenost in razumevanje problematike ohranjanja ekosistemov celinskih voda.

Ključne besede: šola v naravi, tabor, adolescenti, ozaveščanje, ekosistemi celinskih voda

Introduction

Freshwater ecosystems, particularly wetlands, are the victims of human activities that have led to widespread habitat degradation, flow regulation, pollution, and water extraction, fisheries overexploitation, and alien species introductions (Strayer and Dudgeon 2010). National and international initiatives (e.g. Ramsar Convention, Conservation International) pay much attention to education and raising awareness about the importance of freshwater ecosystem conservation, but whether this will bring the necessary change is a key issue.

Kellert (1996) believes that education plays a crucial role in creating environmentally conscious citizens. Slovenian school curricula devote attention to freshwater ecology and freshwater ecosystem conservation, particularly in the last years of primary and in secondary schools.

One of the key questions is whether information is the locked door that prevents us, as a society, to change our behavior towards freshwater ecosystems. Knowing about something does not necessarily mean caring or conserving it. Educational programs that simply provide information often do not lead to the changes hoped for, except where the lack of information is a significant barrier to anticipated behaviour (Schultz 2002).

Environmental education has the potential to affect a wide range of individuals and provides an opportunity to promote pro-environmental behaviour. It focuses on people's abilities to increase their understanding over the long term, affecting their attitudes, behaviour and worldviews in general (Clayton and Myers 2009). Authors emphasise that success of environmental education depends particularly on cognitive development and environmental knowledge (with special attention to knowledge of biology and ecology), affective and motivational factors (especially through connection with nature and feelings about one's self ability to achieve effects in the world), and actual behaviour (participating, taking action and problem-solving).

Becker (2008) emphasized that talking about nature and being in natural surroundings are two different things. He pinpointed the importance of the practical and sensuous approaches to nature and its phenomena. Palmberg and Kuru (2000) found that children participating in different informal education programs such as hiking, adventure trails, field trips and camping, contributed to the development of definable emphatic relationship with nature, knowledge of, and values concerning, nature protection and a development of environmentally responsible actions and skills. Natural environments, nature centres and parks are places where people may develop an increased concern for nature through contact with natural environments and these places provide opportunities for learning about natural systems which may increase the awareness of how nature is threatened by human activity (Kola-Olusanya 2005). According to Kellert (2002) such direct encounters with nature can serve as powerful motivators and stimuli for learning and personal development.

In order for experiences to be individually meaningful, Palmer (2004) suggested that learning experiences must extend beyond just learning something; they should guide people's perceptions of who they really are and what are they capable of. Orr (1994, p. 6) suggests that "we experience nature mostly through sight, sound, smell touch and taste – through a medley of sensations that play upon us in complex ways".

The purpose of this study is to discuss educational outcomes from different activities organized on summer camps. The main goal of the camp was to educate youth about fauna and flora in freshwater ecosystems and about the impact of human activities on these ecosystems. Orr (1993, p. 17) wrote that experiential knowing is based on the assumption that "there is no way to separate feeling from knowledge, or object from subject; there is no good way to separate mind and body from its ecological and emotional context". Putting this into the context of our work we expected that provided outdoor education experiences will have a positive influence on students' understanding and awareness how freshwater ecosystems work and how are threatened by human activity. We were particularly interested at their research skills and attitudes gained by attending the summer camp.

Methodology

Description of summer camps

During the summer of 2009 three research summer camps for youth were organized at three different locations in Slovenia. Participation was voluntary. As Wang et al. (2004) highlighted, young adolescents are more motivated to participate in outdoor education programmes if they join them voluntarily. They should also be provided with a meaningful rationale for participation, given some autonomy for decision-making and to have enjoyable experience during the programme. Camps were held at Fokovci in Goričko, at Fara near the river Kolpa, and at Rakov Škocjan near the river Rak. Participants and mentors stayed in outdoor centres or local schools where food and accommodation was provided. Each camp was six-days in duration and mentors were present at the camps the entire time.

Every morning participants were divided into groups of four to five persons and each group was led by one mentor. The purpose of the research activities was not to educate the young people solely on one aspect of the freshwater ecosystem, but to provide a broader understanding; therefore, each day a particular group studied a different aspect of the environment and they changed mentors daily. They undertook a study on marsh and other aquatic plants, tracking animals, watching birds, analyzing chemical and ecological conditions of freshwater ecosystems, catching and determining species of amphibians and butterflies. Due to different research goals and methods, each mentor prepared a variety of research activities, but they tried to have the same pedagogical approach. To achieve this, mentors had previously agreed on how to work and every evening throughout the educational program they met and share their experiences and views. Mentors endeavoured to give the participants a clear and short introduction to the research goals and instructions how to use research equipment. Then they tried to "back up" and give participants a chance to explore and research nature on their own. Mentors thus had the role of consultants and facilitators. They pointed out some interesting and specific details or raised questions when this was necessary.

Every afternoon the camps were active with artistic workshops, orientation and sports games, which enriched the afternoons at the camps. A wide selection of workshops and games, attended by all the participants, offered the young people an opportunity to develop and discover their talents and to establish themselves among their peers and mentors. Mentors regularly participated in these activities. The purpose of the games was also to improve group dynamics among the participants; therefore, significant attention was given to these activities during the first few days in order to develop mutual respect among youth and between youth and mentors. It should be noted that much attention and time was devoted to order and mutual respect, which are prerequisites for the safe and efficient completion of the camp. Towards the end of the camp, more autonomy and responsibility for research activities, workshops and games were assumed by the participants themselves. In this context, group dynamics "builds" and develops from the first to the last day of the camp. These workshops were related to the freshwater ecosystems (for example, quizzes, treasure hunting, photographic exhibition...).

The participants spent the evenings in the company of guests, renowned researchers who have presented their own career histories that have led them to work on scientific research. We hosted researchers from various scientific fields such as forestry, nature conservation, ornithology, entomology, botany, physiology and geography together with some artists whose work is very connected to nature, such as photographers. The purpose of inviting renowned researchers was to give participants positive stimulus for their early future decisions about their future career paths.

At each camp we organized a long hike to a location of a natural or cultural heritage site (waterfall, castle, hill). We usually organized it on the fifth or sixth day of the camp when the participants had already had the chance to get to know each other and establish mutual trust and respect. We used the hike to discuss further education and careers, share impressions of the camp but also with some social group activities such as singing.

Participants

The camps were attended by 15 males and 27 females, aged 11 to 18 (*mean age* = 13). Summer camps were organized in June and July 2009. Participants were not selected, but they themselves signed up to attend the camp.

Qualitative and quantitative methods

Educational outcomes were measured on fifth and sixth day of each camp, using quantitative (structured questionnaire) and qualitative (focus groups discussion) methods.

A structured questionnaire was developed based on educational goals. For each statement respondents were asked to score their personal opinion on a scale ranging from strongly disagree (1); disagree (2); cannot say (3); agree (4); strongly agree (5) (Likert, 1932). A prototype of the questionnaire was tested with five 11 to 13-year old girls who, being in the same age class as the participants, were thought to represent a reasonable match with the sample population of participants. The questionnaire was completed on the last day of the 6-days long camp.

An analysis of participants' posters and *focus group discussions* was used to evaluate the camps' activities. On the fifth day each participant made a poster expressing their impressions of the activities that were organized during the camp. When making the posters, students could use images and texts from various magazines, catalogues, calendars and newspapers (all provided), and different coloured pens (Fig. 1). Posters were exhibited and presented in groups of between 7 to 15 participants, followed by a group discussion. This was the starting point for discussion that was developed on the activities that had taken place at the camp. The discussion was moderated by an experienced researcher and tape recorded. Respondents were informed about the use of tape recorder prior the discussion. All the outcomes of camp activities were also presented to their parents, including group discussion and the usage of tape records for research purposes.

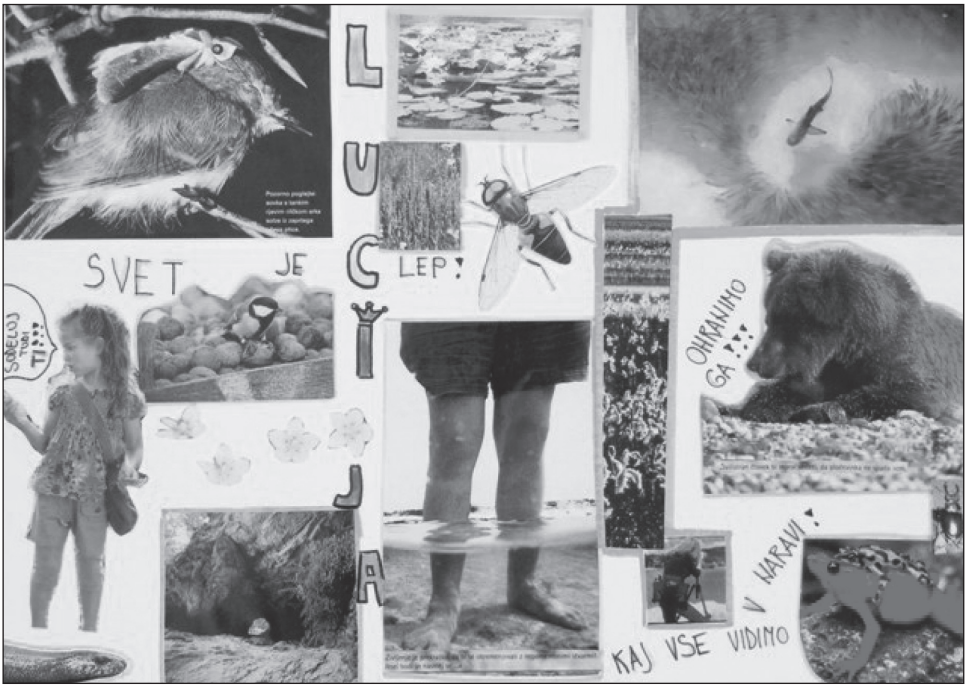

Figure 1: An example of a poster.
Slika 1: Primer posterja.

Data analysis

Data entry and analysis of structured questionnaires was conducted using the Statistical Package for the Social Sciences (SPSS). The data were processed at the level of descriptive and inferential statistics. We used basic descriptive statistics of variables, and the Pearson correlation coefficient in order to analyze the relationships between mean scores for participants' self-evaluation of gained knowledge (Tab. 1), opinions about evening guests (Tab. 2), and awareness and understanding about conservation problems in freshwater ecosystems (Tab. 3). Asterisk (*) denotes items that were rotated to compute an average for each instrument. Cronbach's alpha coefficient for participants' opinions about research activities and learning outcomes was 0.87. For participants' opinions about the evening guests Cronbach's alpha was 0.86. Cronbach's alpha for instrument investigating participants' awareness and understanding about conservation problems in freshwater ecosystems was 0.68. Nunnaly (1978) reported, reliability is satisfactory, when alpha is minimally 0.70 and Fraser (1989) reported that alpha coefficients in the range 0.58 – 0.81 indicate that the instrument has satisfactory reliability.

Qualitative data in the form of images and text from posters were analyzed. Images with the same meaning were coded together. Low-frequency images with the same meanings as high-frequency images were subsumed under the more frequent (general) ones. For example, images of binocular and monocular were coded as research equipment. Images that appeared less than five times, and that could not be coded with others, were excluded. The images were categorized using a criterion of semantic relationship (a similar method is used for analyzing word associations, for example see Sato and James, 1999; Flogaitis and Agelidou, 2003) and the frequency of the images in each category was calculated. The text on the posters was transcribed. As there was little text on the posters this was not sorted into categories. Text was analyzed in combination with comments and explanations recorded in the group discussion following poster presentation. General comments and impressions are discussed in this paper.

Results and discussion

The questionnaire was completed by 42 participants. In the first section participants were asked to give their opinion on the research activities, research methods and learning outcomes (Tab. 1). We were interested to know if participants learned anything new about animals, plants and other natural phenomena in freshwater ecosystems and surrounding environments. The items in Tab. 1 measure participants' self-evaluation of gained knowledge. The results show, that the majority of participants agree that they learned new things. . They were now more familiar with the functions of rivers, lakes and streams in the wild. They agreed that they had opportunities to experience animals and touch them (animals like frogs, snakes, lizards, dragonflies, and butterflies). Kellert (2002) wrote that being in natural environments and confronted with natural phenomena

Table 1: Participants' opinions about research activities and learning outcomes.
Tabela 1: Mnenje udeležencev o raziskovalnih aktivnostih in učnih rezultatih.

Statement (strongly disagree (1) … strongly agree (5))	Mean	SD
I learned so many new things about plant species.	4.29	0.64
I learned so many new things about animal species.	4.33	0.61
I learned a lot about the main characteristics of fresh water.	4.02	0.78
I realized what the functions of rivers, lakes and streams in the wild are.	4.43	0.55
I had the opportunity to experience, touch different animals.	4.83	0.38
I did not like field work in the groups.*	1.45	0.63
I learned new methods of natural science research.	4.48	0.67
I learned how to better observe and distinguish between different animals and plants.	4.52	0.63
I learned to operate research equipment and facilities.	4.48	0.63
I learned to analyze and process the field data.	4.50	0.63

can provide positive stimulus for the educational process of individuals. Moreover, as suggested by Smith, Reynold, Donaldson and Masters (1972), the outdoor education experience maximizes the use of the natural physical environment as a learning laboratory. The learning took place at the primary source and not through secondary resource information (workbook, video material, teacher's experiences and knowledge etc.). Nevertheless, this educational situation does not necessarily guarantee the maximum learning outcomes; much depends on other factors such as a pedagogical approach and student motivation. However, outdoor education gives individuals the optimal starting point – being at the primary source for information (nature).

Participants were also asked to express their opinion about research methods and equipment used in the research activities. Results gathered in Tab. 1 show that participants were satisfied with the work in research groups and they learned much about research methodologies used in particular, how to handle equipment, how to analyze and process research data and how to distinguish different animal and plant species.

Table 2: Participants' opinions about evening guests.
Tabela 2: Mnenje udeležencev o večernih gostih

Statement (strongly disagree (1) … strongly agree (5))	Mean	SD
I did not like the evening guests.*	1.69	0.71
I met a variety of researchers and their work.	4.60	0.50
From the evening guests I learned more about the nature and nature conservation than from my teachers in school.	4.52	0.67
I was impressed how evening guests were dedicated to research work.	4.19	0.99
I also wish to be so successful and devoted to my profession, which I am going to choose.	4.61	0.79

In Tab. 2 participants' opinions about the evening guests are presented. The purpose of presenting different renowned researchers (evening guests) was to motivate participants toward science and research activities. Results show participants liked evening guests and the diversity of their professions. They also reported learning more about nature and nature protection from evening guests than from their teachers in school. We were particularly interested to know if they saw evening guests as positive role models and stimulus for their future decisions in life. The result from the last statement indicated that evening guests, who are renowned researchers, made a positive impression on participants and they want to try to be like them in their future professions.

In the last section of the questionnaire we investigated their awareness and understanding of some conservation problems in freshwater ecosystems (Tab. 3). We are aware that the results gathered after intervention (camp) were without knowing their opinions before entering the camp activities and thus may have limited scientific significance. Nevertheless, we were interested to see how they understand and feel about conservation problems in freshwater ecosystems. Results show that, in general, participants' were aware of the negative effects certain human activities have on freshwater ecosystems and they understand the important role trees have for rivers.

Pearson's product moment correlation coefficient was used to examine the relationships between mean scores for instruments presented in Tab. 1, Tab. 2 and Tab. 3. Participants' who rated research activities and learning outcomes of summer camps higher had also more positive opinions about evening guests ($r = 0.75$; $p < 0.01$). Participants' with positive opinions about evening guests were also more aware and better understood the conservation problems in freshwater ecosystems ($r = 0.34$; $p = 0.03$). Correlation between participants' mean score of research activities and learning outcomes and their awareness and understanding of conservation problems in freshwater ecosystems was almost significant ($r = 0.29$; $p = 0.06$).

On the fifth day of the research summer camps, the participants prepared posters to express their impressions, concerns for, and perceptions of, the camp activities they had experienced during the week. At their disposal there were

Table 3: Participants' awareness and understanding about conservation problems in freshwater ecosystems.
Tabela 3: Ozaveščenost in razumevanje problemov ohranjanja ekosistemov celinskih voda.

Statement (strongly disagree (1) … strongly agree (5))	**Mean**	**SD**
Walled banks of rivers and streams have adverse effect on aquatic organisms.	4.33	0.75
Landfill sites can be a threat to the nearby watercourse.	4.74	0.50
Trees along rivers are important as they prevent erosion of banks and shade the water surface.	4.26	0.94
Along rivers, lakes and streams are too many trees that are causing flooding.*	1.58	0.89
Ponds should be drained, because they set too many insects.*	1.71	0.97

different magazines, newspapers, catalogues and calendars with different content not linked only to nature. The purpose of creating posters was to present their newly acquired knowledge and experiences through the creativity and imagination and to present their view of camp activities. We analyzed the pictures used for making the posters and classified them into five categories: *animals, plants, environments, research* and *other activities*. Within the categories were determined individual elements or groups of elements that occurred in the posters more than five times. We analyzed 39 posters, with a total of 415 images or photographs and texts. Despite the wide range of offered options most pictures appearing on the posters represented animals (48.43%), followed by plants (17.83%), environments (14.22%), research activities (6.02%) and finally other activities (2.41%). Among the *animals* whose pictures had appeared more than five times the prevailing groups were birds (26.87%), butterflies (7.96%), flies (6.97%) and frogs (5.97%). *Plants* represented 17.83% of all pictures used, of those 20.72% represented aquatic plants, 9.46% trees and 6.76% orchids. In the category of *environment* pictures of natural environments (lake, forest, rocks, rivers, sea, marsh) as well as man-made environments (field, orchard, vineyard, city) were represented. Most of the images encountered depicted lakes (20.34%), grassland (13.56%), rocky masses (13.56%) and forests (13.56%). To the category of *research activities* were assigned images that illustrated nature observation, hunting, research equipment and computers. The category *other activities* contained pictures of games, singing, hiking, eating and pictures of workshops. The remaining 9.40% pictures were not categorized (eg. pictures of pregnancy, heart, clouds, feet, umbrella). Results clearly show how fascinated participants were when they were encountering animals and plants. The variety of images used on the posters suggests that participants, at the end of the camp, showed fascination with natural phenomena in general, not only freshwater ecosystems.

We also analyzed the text on posters and participants' poster presentations (focus group discussions). Mostly they reflect the impressions of the camps' activities and nature – the beauty of nature, miracles of nature, colours of nature, friendship at the camp, loyalty, food chain, the camp activities, animals seen at the camp etc. From the discussion following the poster activity we can generally conclude that participants learned a lot about fauna and flora in freshwater ecosystems. They also appreciated the opportunity to explore nature, learn about different professions in science and to talk to established scientists. Qualitative data obtained also show that the research-oriented program at summer camps allowed participants to develop their skills for autonomous learning. Participants feel more competent in expressing their views on the importance of preserving freshwater ecosystems and reflect a high motivation to learn about complexity of nature. Following Palmer's suggestions (2004) summer camp activities provided meaningful learning experiences to participants that go beyond just learning something; they influence on student's personality and competences. By giving them more opportunities, autonomy and responsibility for exploring the natural environment we positively influenced their confidence in personal abilities and motivation to experience nature in a more complex and ecological context.

Conclusions

The present study explored the attitudes of students, aged 11 to 18 years, attending summer camps on the conservation of freshwater ecosystems. The respondents reported that they learned much about freshwater ecosystems, animals and plants, different research methods and handling research equipment. They enjoyed meeting evening guests, who were renowned researchers; they want to try to be like them in their future professions. Participants also showed a high awareness and understanding of problems related to freshwater ecosystem conservation.

The model of outdoor education presented here may be very useful to others interested in working towards motivating more young people towards the sciences and research work. Youth surprised us with their enthusiasm and reasonable, yet childlike, view of the world in which we live. This view was natural, direct and an honest look at the good and bad, the true and quasi-decision we all make in our society. Adults often underestimate the young and do not impose upon them proper burdens of life. Conversations with participants showed that experience of such camps inspire them with certain degree of confidence in themselves and their abilities.

In the future, it would be very useful to recall knowledge and skills in an extended time period to explore if there is any sustained learning as a consequence of the activities experienced at the summer camp.

Povzetek

Ekosistemi celinskih voda, predvsem mokrišča, so pogosto ogroženi zaradi človekovih dejavnosti, kot so regulacije, onesnaževanje, črpanje vode za namakalne sisteme in vnos tujerodnih vrst. Prizadevanja za ohranjanje le teh potekajo tako na nacionalnem kot mednarodnem nivoju (npr. Ramsarska konvencija). Pozornost je namenja tudi vzgojno-izobraževalnim programom, ki bi dvignili znanje in zavest o pomenu ohranjanja ekosistemov celinskih voda. Številni strokovnjaki na področju vzgoje in izobraževanja izpostavljajo pomen zunajšolskih izobraževalnih programov, ki naj bi bolj celovito obravnavali kompleksna naravovarstvena vprašanja, kakršno je ohranjanje ekosistemov celinskih voda. V prispevku obravnavamo vzgojno-izobraževalne aktivnosti, ki so potekale v okviru poletnih taborov za učence in dijake, namenjenih dvigu zavesti o pomenu ohranjanja ekosistemov celinskih voda. Glavni namen taborov je bil mlade poučiti o raznolikosti favne in flore ekosistemov celinskih voda ter o vplivih človekovih aktivnosti na te ekosisteme. Udeleženci so se ob tem spoznavali z različnimi raziskovalnimi metodami. Imeli so tudi priložnost spoznati raziskovalno pot in dosežke uveljavljenih raziskovalcev, ki so mlade udeležence taborov obiskovali ob večerih. Šestdnevni tabori so bili organizirani na treh lokacijah v Sloveniji: Fokovci na Goričkem, Fara ob reki Kolpi in Rakov Škocjan ob reki Rak. Taborov se je skupaj udeležilo 15 fantov in 27 deklet, starih med 11 in 18 let. Vzgojno-izobraževalni rezultati so bili merjeni kvalitativno (posterji in fokusne skupine) in kvantitativno (anketa). Iz kvantitativnih rezultatov lahko zaključimo, da so se udeleženci na taborih veliko naučili o ekologiji celinskih voda in o različnih raziskovalnih metodah ter opremi. Kot pozitivna in navdihujoča ocenjujejo tudi večerna srečanja z uveljavljenimi raziskovalci. Ti so jim na zelo oseben način predstavili svoje raziskovalne začetke in raziskovalno področje, s katerim se ukvarjajo. Udeleženci v odgovorih izražajo tudi visoko ozaveščenost o problematiki ohranjanja ekosistemov celinskih voda. Izračunani Pearsonov koeficient korelacije kaže linearno povezanost med pozitivnimi mnenji udeležencev o pridobljenem znanju o ekologiji celinskih voda, različnih raziskovalnih metodah in opremi, ki so ga pridobili na taboru, ter njihovim pozitivnim mnenjem o večernih srečanjih z uveljavljenimi raziskovalci. Udeleženci, ki pozitivno ocenjujejo večerna srečanja z uveljavljenimi raziskovalci so bili tudi bolj ozaveščeni o problematiki ohranjanja ekosistemov celinskih voda. Analiza kvalitativno pridobljenih podatkov je pokazala, da je raziskovalno delo na taborih omogočalo udeležencem, da razvijajo svoje sposobnosti za raziskovalno učenje ter krepijo svoj pozitiven odnos do narave. Udeleženci se počutijo bolj kompetentne pri izražanju svojih stališč o pomenu ohranjanja ekosistemov celinskih voda in izražajo visoko motiviranost za spoznavanje narave in njene ekološke kompleksnosti.

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