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# Experiences of Slovenian In-Service Primary School Teachers and Students of Grades 4 and 5 with Outdoor Lessons in the Subject Science and Technology

Maruša Novljan[1] and Jerneja Pavlin*[2]

The present paper presents the results of a survey on outdoor lessons conducted by teachers of the subject Science and Technology in the 4th and 5th grades of primary school in the school's vicinity. It examines differences between teachers themselves and between teachers and students, as well as the ideas and limitations of outdoor lessons. The study included 70 in-service primary school teachers of the 4th and 5th grades and 154 students of the 4th grade and 151 students of the 5th grade of primary school. The data were obtained with two questionnaires: an e-questionnaire for teachers and a paper-pencil questionnaire for students. The results show that 13 per cent of teaching time in the subject Science and Technology consists of outdoor lessons. Statistically significant differences were found between teachers with different amounts of teaching experience, while differences in the quantity of outdoor lessons did not arise among teachers of different school strata and among teachers who had an early experience with outdoor lessons in the vicinity of school themselves as students compared to teachers who had no such experience. The teachers had several specific and general ideas for outdoor activities for the thematic sets of the Science and Technology curriculum and reported similar difficulties in planning outdoor lessons to those reported in other countries. The results of the research show that the teachers report the use of outdoor lessons in the vicinity of school more often than recalled by the students. The students reported that such activities typically take place about twice a year, mostly in playgrounds, meadows, and forests. The results provide an insight into the state of the teachers' initiatives for outdoor lessons in the subject Science and Technology and indirectly offer opportunities to reflect and act on outdoor lessons from different perspectives.

**Keywords:** outdoor lesson, primary school, the subject Science and Technology, teachers' experiences, students' experiences

1 Nove Jarše Elementary School, Slovenia.

2 *Corresponding Author. Faculty of Education, University of Ljubljana, Slovenia; jerneja.pavlin@pef.uni-lj.si.

# Izkušnje slovenskih učiteljev in učencev 4. in 5. razreda osnovne šole s poukom na prostem pri predmetu naravoslovje in tehnika

Maruša Novljan in Jerneja Pavlin

Ta prispevek predstavlja izsledke raziskave o pouku na prostem pri predmetu naravoslovje in tehnika v 4. in 5. razredu osnovne šole v okolici šole. Preučuje razlike med učitelji ter med učitelji in učenci pa tudi ideje in omejitve pouka na prostem. V raziskavo je bilo vključenih 70 učiteljev 4. in 5. razreda ter 154 učencev 4. razreda in 151 učencev 5. razreda osnovne šole. Podatki so bili pridobljeni z dvema vprašalnikoma: e-vprašalnikom za učitelje in z vprašalnikom tipa papir – svinčnik za učence. Učitelji navajajo, da 13 odstotkov časa pri predmetu naravoslovje in tehnika predstavlja pouk na prostem. Statistično pomembne razlike so bile ugotovljene med učitelji z različno količino izkušenj s poučevanjem, medtem ko se razlike v količini pouka na prostem niso odrazile med učitelji glede na stratum šole in učitelji, ki so imeli kot učenci zgodnje izkušnje s poukom na prostem v bližini šole, v primerjavi z učitelji, ki niso imeli takšnih izkušenj. Učitelji so imeli več specifičnih in splošnih idej za dejavnosti na prostem za tematske sklope iz učnega načrta za predmet naravoslovje in tehnika in so poročali o podobnih težavah pri načrtovanju pouka na prostem, kot so zaznane v tujih virih. Rezultati raziskave kažejo, da učitelji pogosteje poročajo o uporabi pouka na prostem v bližini šole, kot so ga učenci zaznavajo. Učenci so poročali, da se takšne dejavnosti običajno odvijajo približno dvakrat letno, večinoma na igriščih, travnikih in v gozdovih. Rezultati omogočajo vpogled v stanje pouka na prostem pri predmetu naravoslovje in tehnika ter posredno ponujajo priložnosti za razmislek in ukrepanje glede pouka na prostem z različnih vidikov.

**Ključne besede:** pouk na prostem, osnovna šola, predmet naravoslovje in tehnika, izkušnje učiteljev, izkušnje učencev

## Introduction

Today's children spend too much time sitting (playing computer games, using social networks, online learning, watching TV, etc.) (Bank & Greve, 2013; Štemberger, 2012). School should ensure that students are as active as possible in their classes. Ceciliani and Bortolotti (2013) report that students are mainly active outdoors, engaging in activities, such as walking, socialising, and similar. They move in the manner that the natural environment enables them to move, even if no toys are available. If students do not have the tools to move in a certain way, e.g., by walking, they engage with natural objects (pebbles, sand, small sticks, etc.). Furthermore, it has been demonstrated that outdoor learning positively influences children's wellbeing (health, immune system), creativity and teamwork (DfES, 2006). It is therefore important that students acquire new knowledge and skills not only in the classroom but also outdoors.

The term 'learning outdoors' indicates that learning takes place outside of buildings. Such a definition of outdoor learning is endorsed by many authors, who provide a more precise definition of the term. Outdoor learning is teaching and learning with an emphasis on multisensory experiences (Gilbertson et al., 2006), and it is a concept involving educational activities in a different environment. The English Outdoor Council (n. d.) describes outdoor learning as a physical activity related to the natural environment. Outdoor learning does not include activities such as visiting museums and art galleries or physical education (Rickinson et al., 2004). However, Tuuling et al. (2018) report that outdoor learning is most often perceived by teachers as a free activity or play outdoors rather than as learning. The authors emphasise that outdoor learning can also be a kind of journey involving trying out, smelling and touching objects in the 'home' environment.

Gilbertson et al. (2006) emphasise that the place of outdoor learning is the outside world away from the classroom. Classes are taught outdoors or in an environment that is physically different from the classroom (Peacock & Pratt, 2009). Local spaces such as farms, beehives, hunting lodges, botanical gardens, parks or the schoolyard support teachers by making it easier to organise learning outdoors in locations that are readily accessible (MacQuarrie, 2016). Teachers can organise outdoor learning for only a few minutes (motivation for class), for one school lesson (learning new content), for several school lessons, for one day (outdoor classroom day) or for several days (camp), but the duration of outdoor learning also affects the teacher's organisation: the longer the outdoor learning lasts, the more difficult it is to plan. Research carried out in Scotland (Nicol et al., 2007) reports that students study outdoors for approximately 19 minutes every week. Waite (2011) found that the majority (80%)

of students (6–11 years) perceive that they are physically active outdoors every week or at intervals of several weeks. In organising outdoor learning, teachers can also consider cross-curricular integration of the mother tongue, mathematics, the physical environment, and similar., as Tuuling et al. (2018) found in their research. Šebjanič and Skribe Dimec (2019) point out that outdoor learning makes children curious and does not bore them.

Furthermore, students should be equipped with skills that can be transferred to later life. The effective organisation of outdoor learning is possible if the teacher likes to be outdoors, is creative and interacts with different people (foresters, beekeepers, farmers, etc.). However, Skribe Dimec and Kokalj (2018) suggest involving students in planning activities for outdoor programmes, making them more motivated, creative, and focused.

Outdoor lessons have both positive and negative sides. The positive sides of learning outdoors are reflected in various aspects of the child's development. Physical activity outdoors improves children's manual skills, coordination, balance, and physical activity. Students become more relaxed when learning or playing spontaneously, which leads to better attention, more motivation and faster perception (promotion of a higher level of knowledge), thus improving student success and performance (Fiskum & Jacobsen, 2012). Some researchers (Gill, 2014; Mygind, 2009; Rickinson et al., 2004; Sjöblom & Svens, 2019; Waite, 2010) report that students are more relaxed when playing, resulting in group trust, connection, and participation. Children are dynamic while learning outdoors, constantly changing the environment they explore to satisfy their curiosity (Tovey, 2008). Malone (2008) also argues that outdoor learning has a positive impact on children's learning and supports healthy children's development. Also, outdoor learning is expected to influence cognitive (learning), physical (physical experience), social (social interaction), emotional (emotional wellbeing) and personal (the child's response) development.

Outdoor lessons use individual teaching methods and offer opportunities for rich interdisciplinary connections/learning in the open air in a real environment (Beames et al., 2012; Potočnik & Devetak, 2019; Štemberger, 2012). It is also possible to include ICT, including as apps such as the Woody Species Identification Digital Dichotomous Key (Laganis et al., 2017). Outdoor learning plays a key role in educating young people about our planet and thus in providing environmental education. The English Outdoor Council (n. d.) notes that such learning makes it easier for students to understand the importance of nature conservation better. Outdoor learning develops the students' understanding of the importance of sustainable development (Beames et al., 2012; English Outdoor Council, n. d.; Torkar, 2013; Torkar et al., 2020).

However, Skribe Dimec and Kokalj (2018) emphasise that Slovenian teachers, parents, and students are not sufficiently aware of the positive aspects and opportunities of outdoor learning. The negative aspects of outdoor learning are primarily economic concerns (professionalism of teachers, literature), limited time, and the number of teachers required to ensure the safety and health of children (Jeronen & Jeronen, 2012), especially with regard to weather and the overcrowding of curricula (Rickinson et al., 2004; MacQuarrie, 2016). Numerous authors have proposed strategies to avoid the negative aspects. For example, Barker et al. (2002) suggest that outdoor learning could be conducted at shorter intervals and last for a longer period. Tuuling et al. (2018) found that outdoor learning was not effective when there was noise, traffic, or other children in the playground. They pointed out the following negative factors regarding outdoor teaching: lack of time, lack of outdoor lesson space, lack of equipment for outdoor work, lack of knowledge and experience of teachers, and lack of safety (ticks, stray dogs, etc.). The outdoor groups of students in many Finnish schools are often large; therefore, some students do not feel comfortable due to differences in learning and phobias (Jeronen & Jeronen, 2012). It has been pointed out that teachers prefer traditional teaching and do not consider research showing students' reactions to outdoor learning. However, Walan and Chang Rundgren (2014) noted that curricular changes could lead to teachers becoming aware of science knowledge and the need for further education.

As mentioned above, outdoor lessons have both positive and negative aspects, but there are many projects (e.g., the day out) that help the teacher organise outdoor lessons more quickly and easily. Outdoor Classroom Day is when many teachers in different countries use a tree instead of classical boards, grass instead of chairs, and so on. The project aims to spend at least one hour outdoors with students (Outdoor Classroom Day, 2020). Fägerstam (2013) reports on a project in which teachers were questioned at the beginning of the project and after one year. It was found that the project teachers had more ideas for outdoor lesson activities and that they found learning with all of the senses more effective because the students were enthusiastic about the unusual space during outdoor learning. Policymakers designing curricula must also consider the initiatives of teachers and students in order to provide them with a more focused, playful and natural environment (Gill, 2014). The European Social Fund allows EU Member States to receive funding for such initiatives, so many updates and adaptions in outdoor education are expected (Skribe Dimec & Kokalj, 2018).

## The Slovenian school system and the integration of outdoor learning

This study on outdoor lessons refers to the Slovenian school system. Students enter compulsory schooling at the age of six years. Primary school has nine grades, of which five correspond to the primary level (grades 1–5) and four to the lower secondary level (grades 6–9 in other countries). The Council of Experts for General Education in Slovenia approves the national curricula and determines the subjects and the curricula of the subjects, but the choice of teaching methods and textbooks is left to the teachers (MIZŠ, 2018; Taštanoska, 2017). Students start to learn about the world of science, technology, and society through the subject Environmental Studies (Kolar et al., 2011). In the 4$^{th}$ and 5$^{th}$ grades (students aged 9 and 10), they deepen their knowledge in the subject Science and Technology and the subject Society (Vodopivec et al., 2011).

Outdoor lessons are integrated into the national curriculum for primary and secondary schools in Slovenia. On the organisational level, they are mainly implemented through activity days (15 days) and outdoor school (Skribe Dimec, 2019; Dnevi dejavnosti, 1998). Three activity days with science activities are prescribed for grades 4 and 5, each with five school hours. Most schools conduct science activities outside the school area, but activities do not have to take place outside: an activity day can also take place in a museum, gallery, or similar. Outdoor school is also part of the compulsory curriculum. It lasts three or more days in a row and takes place away from the school area. The school must organise outdoor school at least twice in the nine years of primary school (Gros et al., 2001). In Slovenia, outdoor school usually takes place in CŠOD (Centre for School and Outdoor Education) centres, where it is executed by external contractors (Šebjanič & Skribe Dimec, 2019).

As mentioned above, the subject Science and Technology is taught in grades 4 and 5, with a total of 105 school hours per school year (Vodopivec et al., 2011). The general objective of the Science and Technology curriculum emphasises the need for students to gain experience in the field of soft scientific and technical research appropriate for school students. This indicates that, according to the abilities and age of students, outdoor learning is an essential part of the subject.

In the subject Science and Technology, students must have the opportunity to learn experientially. Teachers can provide time in various natural and artificial environments, where students can make observations using simple aids. At the same time, they learn about natural processes and phenomena, asking themselves questions and finding answers through experiments. Students experience some natural (not dependent on human intervention) and artificial

(dependent on human intervention) systems by directly observing how they work and how they are composed (Vodopivec et al., 2011).

The Science and Technology curriculum also includes operational learning objectives (compulsory and optional) and content under five thematic sets: Matter, Forces and Motion, Phenomena, Humans, and Living Beings. (Table 1). The large number of operational objectives is not reflected in a large number of content areas. However, the operational learning objectives do not indicate whether the objective can be achieved through outdoor learning. This demonstrates how important it is for the teacher to read the curriculum and know the content of general didactics and special didactics. A well-qualified teacher can find an opportunity to plan outdoor lessons and determine their location (Pečar et al., 2020).

**Table 1**

*Number of operational learning objectives and listed content areas for each specific thematic set of the Science and Technology curriculum*

| Thematic set | Matter | Forces and Motion | Phenomena | Humans | Living Beings |
|---|---|---|---|---|---|
| Number of operational objectives | 57 (48*+9**) | 34 (29*+5**) | 52 (39*+13**) | 32 (27*+5**) | 40 (28*+12**) |
| Number of content areas | 12 (12*) | 16 (13*+3**) | 12 (9*+3**) | 15 (15*) | (13*) |

*Note.* *Compulsory learning objectives; **Optional learning objectives. Adapted from Vodopivec et al., 2011.

## Research problem and research questions

In Slovenia, the study of various aspects of outdoor learning is increasing, especially at the primary level. For example, a search using the COBISS library cataloguing system on 10 September 2020 for the keywords in Slovenian 'outdoor education' (*pouk na prostem*) and 'primary level' (*razredni pouk*) returned 159 graduation theses, 23 master's theses and one doctoral thesis. When the search was narrowed with the addition of the keyword 'science' (*naravoslovje*), four graduation theses and three master's theses were returned. The data search was done by checking documents and not only the keywords listed in the documents.

The 'science' graduation and master's theses describe various aspects of outdoor learning, with a description and evaluation of activities outdoors,

learning pathways, CŠOD centre activities, working in combined classes with an emphasis on elementary science, and making use of natural resources in the surroundings of the specific primary school. The authors note that the immediate surroundings of the school play an important role in non-obligatory outdoor lessons. To the best of our knowledge, there is no Slovenian study about the quantity of non-obligatory outdoor lessons in the subject Science and Technology, nor about the perception of outdoor lessons from the perspective of teachers and students. Therefore, we wanted to investigate the extent of outdoor Science and Technology classes in the vicinity of school in the 4$^{th}$ and 5$^{th}$ grades of primary school, focusing on classes that are not compulsory, are not part of outdoor activity days or school outdoors, and are not part of formal out-of-school programmes, which are often led by staff from outdoor centres and can take place in CŠOD centres. In addition, we wanted to investigate the differences between teachers in terms of the location of the school, the teachers' work experience, and their own early experience of outdoor lessons (when they were primary school students) compared to their current teaching. The study also focuses on identifying the status of the organisation of outdoor lessons in the vicinity of school and the identification of outdoor lessons in the school environment by students and their views on such lessons.

As described in *The Slovenian School System and the Integration of Outdoor Learning*, the Science and Technology curriculum does not determine the number of hours spent outdoors (Vodopivec et al., 2011). Therefore, our study aimed to investigate the status of non-compulsory outdoor lessons in the vicinity of the school (which are not part of science day activities or outdoor school) and to compare the results with the location of the school where the teachers teach, as well as the teachers' level of teaching experience and their early experiences with outdoor lessons (during their own schooling). Other aims were to examine the teachers' ideas and identify barriers with content prescribed in the curriculum and evaluate the students' experiences of outdoor lessons in the school environment.

With regard to the research aims, the following research questions (RQs) were addressed:

RQ1: How frequently do teachers teach specific thematic sets from the Science and Technology curriculum as outdoor lessons, and how much time is devoted to such teaching in total?

RQ2: Are there statistically significant differences between teachers in the time devoted to outdoor lessons in the vicinity of the school in Science and Technology regarding: a) the location of the school, b) the teachers' work experience, and c) the teachers' own experience in their early years?

RQ3: Are there differences between the specific and general ideas of teachers regarding conducting outdoor lessons in the vicinity of the school and the thematic sets written in the Science and Technology curriculum?

RQ4: With which thematic sets from the Science and Technology curriculum do teachers have more difficulties in preparing outdoor lessons in the vicinity of school?

RQ5: How often and where do students perceive outdoor lessons in the vicinity of the school in the subject of Science and Technology?

RQ6: Which topics are of interest to students with regard to conducting outdoor lessons in the vicinity of the school in the subject Science and Technology?

## Method

The study used a descriptive pedagogical research method and a quantitative research approach.

### *Sample*

An email with a link to an online anonymous questionnaire was sent to the headmasters of all Slovenian primary schools (451) with an email address publicly available on their websites and forwarded to teachers. A total of 70 in-service primary school teachers working with 4$^{th}$ and 5$^{th}$ grade students responded positively and participated in the study. In addition, 21 randomly selected primary schools were requested to gather data about 4$^{th}$ and 5$^{th}$ grade students' experiences with outdoor lessons. Of these, six schools gained the approval of school management and parents, resulting in 26 classrooms responding positively to the request. A total of 305 students from all statistical regions of Slovenia completed a paper-and-pencil questionnaire: 154 fourth-grade students and 151 fifth-grade students. The teachers were not pre-selected.

### *Data collection*

The data were collected using an electronic questionnaire in Slovenian for teachers and a paper-and-pencil questionnaire for students. Both questionnaires were designed for the purpose of the study. The existing literature was first reviewed. Based on the set of research questions, pilot versions of the instruments were prepared and reviewed by two independent science educators. The questions were then modified, pilot-tested (the teacher questionnaire on five fellow teachers and the student questionnaire on five students) and adapted. The instrument used descriptive categories and appropriate Likert scales. Both

questionnaires included a definition of the term outdoor lessons as lessons that take place outside the classroom, outdoors, in the natural environment; they take place in the vicinity of the school, and do not include lessons during nature and technology days, visits to the zoo, botanical garden, museums, or similar.

The teacher questionnaire contained 19 questions, divided into three parts. The first part of the questionnaire contained four closed-ended questions about the respondent (gender, class taught, years of teaching experience, and location of the school). The second part included four closed-ended questions, one open-ended question and one semi-open question, all asking about outdoor lessons. In the third part, four closed-ended questions, two open-ended questions and three semi-open questions asked about the content of outdoor lessons in the vicinity of the school, as required by the Science and Technology curriculum.

The student questionnaire was divided into three parts. Three closed-ended questions asked about gender, class, and the location of the school. Two semi-open questions and one open-ended question inquired about outdoor lessons in the school environment, and three open-ended questions were about the students' specific experience of outdoor lessons in the school environment.

***Data analysis***

The anonymity of the data was guaranteed for research purposes when processing the data. The data was collected in Microsoft Office Excel and statistically processed in SPSS (Statistical Package for the Social Sciences). Basic statistics were used to describe the distribution of the individual variables. Descriptive statistics were used to describe the data: *M* arithmetic mean, *SD* standard deviation, *N* number of teachers/students, and *f* (%) (relative) frequency of occurrence of each answer. The associations between the individual variables were calculated using the nonparametric Mann-Whitney test and the Kullback 2Î-test to explain the relationship between the quantity of outdoor lessons in the vicinity of the school and the school location or the level of work experience or early years' experience with outdoor lessons (Pallant, 2011). Because the Mann-Whitney test works by examining differences in the ranked positions of scores in different groups, the values of mean ranks (*MR*) are added. The statistical hypotheses were tested with an alpha error rate of 5%. To describe whether the effects have a relevant magnitude, the effect size measure eta squared was used to describe the strength of a phenomenon. Benchmarks to define small (.01), medium (.06) and large (.14) effects were provided by Cohen (1988).

The answers to the open-ended questions were analysed qualitatively and quantitatively. Two researchers (i.e., the authors of the present paper)

independently read the answers several times, identifying the thoughts with the most important meanings and assigning codes. The coding played a crucial role in analysing the data, as it enabled their organisation and interpretation through the similarities and differences of the answers. The codes were grouped into categories based on the study's research questions and objectives (Vogrinc, 2008). Cross-checking showed a high degree of agreement between the codes assigned by the two researchers: 98% of the codes were the same, and the authors discussed the remaining cases and reached a compromise.

## Results and discussion

The results and discussion are presented according to the research questions.

***RQ1: How frequently do teachers teach specific thematic sets from the Science and Technology curriculum as outdoor lessons, and how much time is devoted to such teaching in total?***

When asked what proportion of Science and Technology hours are taught as outdoor lessons in the vicinity of the school, 39.1% of the 69 (one respondent did not reply to this question) 4th- and 5th-grade teachers answered that they spend 10 out of 105 hours in the subject Science and Technology doing outdoor lessons in the school environment (Table 2). Some 66.5% of the teachers answered that they teach 10% or less of the subject as outdoor lessons, while 33.1% answered that they teach more than 10% as outdoor lessons. If we compare these responses with the hours required by the Science and Technology curriculum (105 hours), we find that teachers spend 10.5 hours doing outdoor lessons. While less than a third (27.4%) of the 4th- and 5th-grade teachers responded that they offer fewer than 10 hours of outdoor lessons in the school environment, 33.1% responded that they offer more than 10 hours of outdoor lessons (Table 2).

**Table 2**

*Teachers' responses to the question about the extent of outdoor school-based lessons within the subject Science and Technology*

| The quantity of outdoor lessons in the vicinity of school as a percentage of total time for the subject | *f* | *f* % | Hours of curriculum (out of 105) |
|---|---|---|---|
| 2 | 1 | 1.4 | 2.1 |
| 3 | 2 | 2.9 | 3.2 |
| 5 | 15 | 21.7 | 5.3 |
| 8 | 1 | 1.4 | 8.4 |
| 10 | 27 | 39.1 | 10.5 |
| 15 | 1 | 1.4 | 15.8 |
| 20 | 11 | 15.9 | 21.0 |
| 25 | 1 | 1.4 | 26.3 |
| 30 | 9 | 13.0 | 31.5 |
| 40 | 1 | 1.4 | 42.0 |
| **Total** | **69** | **100.0** | |

The mean of teachers' responses regarding the extent of outdoor lessons in the subject Science and Technology is 13.49% (*SD* = 9.03%), which means that on average, teachers spend 14 of the 105 total hours required by the Science and Technology curriculum outside. The range was from 4.46% to 22.52%, which means the respondents spent between 5 and 24 hours outdoors in the vicinity of the school.

The teachers' answers refer to the entire school year, which has 35 weeks. If 14 school hours (with a duration of 45 minutes) per school year are spent learning outdoors in the vicinity of the school, this means that outdoor Science and Technology lessons are typically held once or twice a month (18 minutes per week). Research by Waite (2011) shows that students have outdoor physical activities at least once per week, but it should be noted that the research does not specify whether this relates exclusively to the subject Science and Technology or whether it involves another subject (e.g., sport). Nicol et al. (2007) report that students in a study on Scottish primary schools spent a total of 19 minutes per week outdoors in a variety of subjects, which means that the percentage in Slovenia for just one subject is higher. However, the percentage sometimes does not reveal the complete picture, as there are always some teachers who teach outdoors very little, while a few do so very often, as shown in Table 2.

Moreover, from Table 3, it is evident that teachers rarely teach content from the thematic set Living Beings outdoors, while content from the other four thematic sets is sometimes taught as outdoor lessons.

**Table 3**

*Frequency of outdoor lessons for a particular thematic set from the Science and Technology curriculum on a 5-point Likert scale (1 is never and 5 is always)*

| Thematic Set | Matter | Forces and Motion | Phenomena | Humans | Living Beings |
|---|---|---|---|---|---|
| *M* | 2.69 | 2.94 | 2.96 | 2.35 | 2.97 |
| *SD* | .75 | 1.08 | .96 | .94 | 1.03 |

***RQ2: Are there statistically significant differences between teachers in the time devoted to outdoor lessons in the vicinity of the school in Science and Technology regarding: a) the location of the school, b) the teachers' work experience, and c) the teachers' own experience in their early years?***

The data collected showed that teachers in rural schools devoted more time to outdoor lessons in the vicinity of the school than teachers in urban schools did (Table 4). However, there are no statistically significant differences ($U$ = 446.500, $p$ = .077) between rural and urban schools in the quantity of outdoor lessons taught in the subject Science and Technology. Vidmar (2016) argues that the location of the school in Slovenia does not influence the need for a school garden, which could confirm that the location does not play a role in the quantity of outdoor activities, as shown in our study.

**Table 4**

*The average percentage of time that the subject Science and Technology is taught outdoors in the vicinity of the school according to the location of the school*

| School Location | *N* | *M* [%] | *SD* [%] | *MR* |
|---|---|---|---|---|
| Rural school | 28 | 15.54 | 10.12 | 40.57 |
| Urban school | 42 | 11.81 | 8.16 | 32.12 |

From the results presented in Table 5, we can conclude that the majority of teachers (81.8%) with up to five years of teaching experience teach 0–10% of the total subject hours as outdoor learning in the vicinity of the school. In contrast, 45.8% of more experienced teachers, who have taught for more than 15 years, report that the proportion of outdoor lessons is greater than 10%. The results of Kullback's 2Î-test revealed statistically significant differences with a high effect size (2Î = 13.550, g = 6, $p$ = .035, =.194) between the years of teaching experience of the 4th- and 5th-grade teachers in terms of the extent of outdoor

lessons in the subject Science and Technology: teachers with more teaching experience conduct outdoor lessons more often. The results are consistent with a study by Harlen and Holroyd (1997), who argue that work experience plays an important role in teachers' self-esteem. The more work experience teachers have, the greater their self-confidence (Walan & Chang Rundgren, 2014).

**Table 5**

*The quantity of outdoor lessons expressed as a percentage of time in the Science and technology curriculum according to years of teaching experience*

| | | | Quantity of outdoor lessons in the vicinity of the school | | | | |
|---|---|---|---|---|---|---|---|
| | | | 0–10% | 11–20% | 21–30% | Over 40 % | Total |
| Years of teaching experience | 0–5 years | *f* | 9 | 1 | 1 | 0 | 11 |
| | | *f* % | 81.8 | 9.1 | 9.1 | .0 | 100.0 |
| | 5–15 years | *f* | 11 | 0 | 0 | 0 | 11 |
| | | *f* % | 100.0 | .0 | .0 | .0 | 100.0 |
| | Over 15 years | *f* | 26 | 11 | 10 | 1 | 48 |
| | | *f* % | 54.2 | 22.9 | 20.8 | 2.1 | 100.0 |
| **Total** | | ***f*** | **46** | **12** | **11** | **1** | **70** |
| | | ***f* %** | **65.7** | **17.1** | **15.7** | **1.4** | **100.0** |

Table 6 shows that about half of the teachers surveyed experienced outdoor lessons in their early years, meaning that they remember having outdoor lessons themselves as primary school students. Rogoff's theory, which was confirmed in 1990, states that early experiences should influence further belief (Blatt & Patrick, 2014). Hawley and Gunner (2000) argue that knowledge, attitudes, and social skills in later life depend on early childhood experiences. Klofutar et al. (2020) report that direct outdoor experiences lead to a greater increase and persistence of acquired skills. Tomažič and Vidic (2013) also report that early experiences are of great importance in shaping lifelong attitudes. Vidmar (2016) notes that nearly half of classroom teachers (45.8%) had experience gardening before primary education. According to Vidmar (2016), teachers with early experience are more in favour of school gardens than teachers without early gardening experience. A study by Shume and Blatt (2019) also shows the importance of participants' youthful experiences in the outdoors for their positive intentions with regard to taking students outside. In our case, however, the Mann-Whitney U-test did not show statistically significant differences ($U$ = 552.500, $p$ = .878) between teachers with early experiences of

outdoor lessons and those without such experiences with regard to the quantity of outdoor lessons.

**Table 6**

*The average percentage of time that the subject Science and Technology is taught outdoors in the vicinity of school according to the teacher's early experience with outdoor lessons*

| Teacher's early experience | *N* | *M* [%] | *SD* [%] | *MR* |
|---|---|---|---|---|
| Yes | 33 | 13.97 | 10.73 | 32.17 |
| No | 31 | 12.48 | 7.18 | 32.85 |

***RQ3: Are there differences between the specific and general ideas of teachers regarding conducting outdoor lessons in the vicinity of school and the thematic sets written in the Science and Technology curriculum?***

The teachers' responses to ideas for specific content from the thematic sets in the Science and Technology curriculum were divided into two categories. One category was specific ideas, (i.e., teachers wrote down an activity that they could or could not carry out with students outdoors in the school's vicinity). The second category was general ideas (i.e., ideas that teachers wrote down that could be implemented outdoors in the vicinity of school for specific content). This included all of the answers given by teachers. For example, a suggestion written by one teacher as a general idea was the movement of a car, while another teacher proposed the specific idea of measuring the distance travelled by a car on different surfaces (grass, asphalt, macadam, etc.).

Ideas for outdoor activities (Table 7) that teachers could carry out in the vicinity of the school were provided by the teachers with regard to all of the thematic sets of the Science and Technology curriculum. The teachers provided the most ideas for outdoor lessons, both specific and general, in the thematic set Forces and Motion (54 ideas). They wrote the most specific ideas (29 ideas) in the thematic set Phenomena and the most general ideas in the thematic set Living Beings (32 ideas). Comparing the results from Tables 3 and 7, we find the lowest number of ideas written in the thematic set Humans, which is reflected in the rare implementation of outdoor lessons for this thematic set. For the other four thematic sets, the number of all of the ideas listed and the frequency of outdoor lessons are more similar. However, counting the curriculum items presented in Table 1 shows that a smaller number of operational learning

objectives are listed in the thematic set Humans, which is reflected in the lowest number of ideas for outdoor lessons.

**Table 7**

*Teachers' ideas for each specific thematic set of outdoor lessons in the subject Science and Technology*

| | Matter | | Forces and Motion | | Phenomena | | Humans | | Living Beings | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *f* | *f* % | *f* | *f* % | *f* | *f* % | *f* | v % | *f* | *f* % |
| Specific ideas | 28 | 52.8 | 27 | 50.0 | 29 | 59.2 | 15 | 38.5 | 18 | 36.0 |
| General ideas | 25 | 47.2 | 27 | 50.0 | 20 | 40.8 | 24 | 61.5 | 32 | 64.0 |
| **Total** | **53** | **100.0** | **54** | **100.0** | **49** | **100.0** | **39** | **100.0** | **50** | **100.0** |

When researching outdoor lesson activities, we often find biology-related activities; for example, Blatt and Patrick (2014) describe an outdoor lesson activity that focuses on how photosynthesis can be taught to students through experience rather than through diagrams. When we look at the Internet, we find that many websites (Bocks, 2018; Education.com, 2012; Hamid, 2018; Outdoor Classroom Day, 2020; Teach Junkie, 2017) offer the outdoor lesson activities described above, but most of these activities are biology-related. Outdoor lesson activities include driving a small car faster (Teach Junkie, 2017), making bird food and finding micro-animals (Outdoor Classroom Day, 2020; Education.com, 2012; Hamid, 2018).

The reason that one may find several biology-related ideas for outdoors lessons on the Internet in English, even though the authors' country has a similar curriculum for the subject science, might lie in the fact that primary school teachers have an affinity for biology content. This can also be identified in the more common difficulties that pre-service and in-service primary school teachers face in their knowledge and understanding of chemistry and physics content (Juriševič et al., 2008; Lelliott & Rollnick, 2010; National Curriculum in England, 2013; Pavlin & Čepič, 2015). The other reason for the number of biology ideas for outdoor lessons on the Internet may be that in some countries, science education in the lower grades used to focus on biological sciences, while physics and chemistry were only included in the primary school curriculum to a limited extent (Kinnunen et al., 2016).

***RQ4: With which thematic sets from the Science and Technology curriculum do teachers have more difficulties in preparing outdoor lessons in the vicinity of school?***

The Slovenian in-service primary school teachers surveyed either reported difficulties with certain content or stated that they had no difficulties with outdoor lessons. Their responses were then coded into individual coding units (guidance, safety, time limit, space, weather conditions, curriculum overload, material limitations, organisation, etc., as well as no problems). The results presented in Table 8 show that teachers reported the most difficulties with the thematic set *Substances* (64 teachers) from the Science and Technology curriculum. Only four teachers reported that they had no problems with the content of the thematic set *Humans*, while 30 teachers reported that they had difficulties with outdoor lessons in the vicinity of the school. The teachers' problems with outdoor lessons were very general, which corresponds to observations found in the literature (Barker et al., 2002; Rickinson et al., 2004; Tuuling et al., 2018; Waite, 2010). For example, Rickinson et al. (2004) and Barker et al. (2002) list accompaniment and limited time as limitations, while Tuuling et al. (2018) also list safety, material limitations, and space.

**Table 8**

*Teachers' difficulties according to the thematic sets of the Science and Technology curriculum in the field of outdoor lessons in the vicinity of the school*

| Thematic Set | Substances | | Force and Motion | | Phenomena | | Humans | | Living Beings | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teacher's difficulty | *f* | *f* % | *f* | *f* % | *f* | *f* % | *f* | *f* % | *f* | *f* % | *f* | *f* % |
| Guidance | 12 | 18.5 | 8 | 16.3 | 6 | 12.8 | 6 | 20.1 | 9 | 21.4 | 41 | 100.0 |
| Safety | 6 | 9.3 | 8 | 16.3 | 5 | 10.6 | 5 | 16.7 | 7 | 16.7 | 31 | 100.0 |
| Time limit | 7 | 10.7 | 6 | 12.2 | 10 | 21.3 | 3 | 10.0 | 5 | 11.9 | 31 | 100.0 |
| Space | 11 | 16.9 | 5 | 10.2 | 4 | 8.5 | 4 | 13.3 | 6 | 14.3 | 30 | 100.0 |
| Weather conditions | 2 | 3.1 | 2 | 4.1 | 6 | 12.8 | 1 | 3.3 | 1 | 2.4 | 12 | 100.0 |
| Curriculum overload | 2 | 3.1 | 0 | 0.0 | 1 | 2.2 | 0 | .0 | 0 | .0 | 3 | 100.0 |
| Material limitations | 12 | 18.5 | 10 | 20.4 | 6 | 12.8 | 0 | .0 | 4 | 9.5 | 32 | 100.0 |
| Organisation | 5 | 7.7 | 2 | 4.1 | 5 | 10.6 | 4 | 13.3 | 4 | 9.5 | 20 | 100.0 |
| Other | 7 | 10.7 | 5 | 10.2 | 2 | 4.2 | 3 | 10.0 | 4 | 9.5 | 21 | 100.0 |
| No problems | 1 | 1.5 | 3 | 6.2 | 2 | 4.2 | 4 | 13.3 | 2 | 4.8 | 12 | 100.0 |
| **Total** | **65** | **100.0** | **49** | **100.0** | **47** | **100.0** | **30** | **100.0** | **42** | **100.0** | **233** | **100.0** |

***RQ5: How often and where do students perceive outdoor lessons in the vicinity of the school in the subject of Science and Technology?***

The participating students recall having rarely experienced outdoor lessons in science and technology in the vicinity of their school, with 57.7% of the 305 students selecting the response once or twice per school year (Table 9). Some of the students (11.1%) reported that they had either never studied outdoors, or had studied outdoors three times a week or three times every four months. We believe that students do not perceive outdoor activities as a lesson if the activities are playful, instead perceiving such activities as play, as reported by Tuuling et al. (2018). It should be mentioned once again that the students who completed the questionnaire were not necessarily those of the participating teachers, or even the participating schools. Nonetheless, the results still provide some insight into outdoor lessons, as the students were taught by 26 different teachers. There may, however, be a discrepancy between the teachers' answers (once or twice a month) and students' answers in Table 9, as the students perceived outdoor lessons in the vicinity of the school to a lesser extent than the adults did. The reason for the poor perception of outdoor lessons might be that students are often not aware that they are learning, even if the lessons take place in the schoolyard with various activities (Ginnis, 2002; Ross et al., 2007).

**Table 9**

*The quantity of outdoor lessons in the subject Science and Technology in the vicinity of school, as reported by students*

| The quantity of outdoor lessons in the vicinity of school | *f*% |
|---|---|
| Once or twice per school year | 57.7 |
| Once per month | 22.6 |
| Twice per month | 6.6 |
| Every week, once | 1.0 |
| Every week, twice | 1.0 |
| Other | 11.1 |
| **Total** | **100.0** |

We were interested in the location of Science and Technology classes that students remembered as they experienced outdoor lessons. The students' open-ended answers were coded into the following coding units: forest, field, meadow, river, schoolyard, school garden, school environment, park,

institution, nature school, elsewhere, nowhere, and meaningless answer. The students most commonly mentioned the schoolyard (56.5%). Slightly more than a third of the students (37.8%) replied that they had lessons in a forest near the school grounds, and slightly less than a quarter (23.7%) wrote that the outdoor lessons took place on the school meadow or another nearby meadow (Table 10). Some 7.6% of the students wrote outdoor institutions (e.g., museum, zoo, botanic garden) at which they had studied, but that are not within 500 m of the school.

When we compare the research results with the literature, we find that a hard surface, e.g., the schoolyard, often serves as an environment for outdoor lessons (Nicol et al., 2007). Blatt and Patrick (2014) report on the lifestyle of children in urban and rural areas. They claim that children mostly use asphalt surfaces for outdoor physical activities, whereas children in rural areas tend to use natural areas (e.g., garden, meadow, forest, etc). In our study, the students from urban schools most often listed the schoolyard and forests as the location of outdoor lessons, while students in rural schools listed meadows, forest, rivers and fields (Table 10).

Although it is indicated that the students remembered different experiences of outdoor lessons outside the vicinity of the school, teachers probably took advantage of various locations within 500 m of the school for outdoor lesson activities. The students might have reported the forest so often because the curriculum lists content that could be presented in it: moss, ferns and seed plants; flowering and non-flowering plants; tree and shrub species in the immediate environment; invertebrates; or vertebrates (Verovnik et al., 2011).

**Table 10**

*Locations of outdoor lessons around the school given by 262 students (88 from rural schools and 174 from urban schools) out of a total sample of 305 students. Some students provided more than one location of outdoor lessons.*

| | | Students giving the answer | |
|---|---|---|---|
| **Location of outdoor lessons** | **Attending** | ***f*** | ***f* %** |
| Forest | Rural school | 44 | 50.0 |
| | Urban school | 55 | 31.6 |
| | **Total** | **99** | **37.8** |
| Field | Rural school | 16 | 18.2 |
| | Urban school | 0 | .0 |
| | **Total** | **16** | **6.1** |

| | | Students giving the answer | |
|---|---|---|---|
| Location of outdoor lessons | Attending | *f* | *f* % |
| Meadow | Rural school | 49 | 55.7 |
| | Urban school | 13 | 7.5 |
| | **Total** | **62** | **23.7** |
| River | Rural school | 22 | 25.0 |
| | Urban school | 18 | 10.3 |
| | **Total** | **40** | **15.3** |
| Schoolyard | Rural school | 57 | 64.8 |
| | Urban school | 107 | 61.5 |
| | **Total** | **148** | **56.5** |
| School garden | Rural school | 8 | 9.1 |
| | Urban school | 0 | .0 |
| | **Total** | **8** | **3.1** |
| School surroundings | Rural school | 17 | 19.3 |
| | Urban school | 15 | 8.6 |
| | **Total** | **32** | **12.2** |
| Park | Rural school | 2 | 2.3 |
| | Urban school | 0 | .0 |
| | **Total** | **2** | **.8** |

***RQ6: Which topics are of interest to students with regard to conducting outdoor lessons in the vicinity of the school in the subject Science and Technology?***

The present study also focused on students' interest in learning outdoors in the vicinity of their schools. They expressed their ideas on the topics (content) they wanted to learn. Their answers were coded and divided into categories similar to the curriculum content, in order to examine whether it would be possible to implement the students' topics of interest in the existing curriculum (Table 11). The most common responses were that the students wanted to learn about animals (43.5%), plants (25.7%) and other topics (22.6%). Under the heading *Other*, we mainly listed general answers (e.g., about nature, about other things, how to build a house, etc). However, some students also expressed interest in outdoor lessons about water, soil, weather, air, space and the stars, electricity, matter, fire, pollution and gravity. In the vast majority of cases, students' answers corresponded with the content of the curriculum (Vodopivec et al., 2011). Based on the students' short answers, it is not possible to deduce

the extent to which they would like to continue with the given content, but in most cases it would be possible to incorporate the content into the existing curriculum and implement it outdoors. One exception is content on astronomy, especially on space and the stars, which always sparks the curiosity and interest of students of different ages (Susman & Pavlin, 2020). The students' responses do, however, show their interest in outdoor lessons. Šebjanič and Skribe Dimec (2019) found that when teachers give outdoor lessons that are not boring for students and that engage their interest, they equip students with life skills.

**Table 11**

*Content that the students would like to learn in the subject Science and Technology during outdoor lessons, provided by 230 students out of 305*

| Content | Students giving the answer | |
|---|---|---|
| Animals | *f* | 100 |
| | *f %* | 43.5 |
| Plants | *f* | 59 |
| | *f %* | 25.7 |
| Other | *f* | 52 |
| | *f %* | 22.6 |
| Water | *f* | 17 |
| | *f %* | 7.4 |
| Soil | *f* | 5 |
| | *f %* | 2.2 |
| Weather | *f* | 9 |
| | *f %* | 3.9 |
| Air | *f* | 8 |
| | *f %* | 3.5 |
| Space and stars | *f* | 8 |
| | *f %* | 3.5 |
| Electricity | *f* | 6 |
| | *f %* | 2.6 |
| Matter | *f* | 5 |
| | *f %* | 2.2 |
| Fire | *f* | 4 |
| | *f %* | 1.7 |
| Pollution | *f* | 4 |
| | *f %* | 1.4 |
| Gravity | *f* | 3 |
| | *f %* | 1.3 |

## Conclusion

This paper presents a Slovenian study on outdoor lessons in the vicinity of schools. It is based on a sample of 4th- and 5th-grade primary school teachers and students and focuses on lessons outside the prescribed framework of activity days and outdoor school. More specifically, the aim was to investigate the extent to which outdoor lessons in the vicinity of school are carried out by teachers within the subject Science and Technology, and whether this differs according to years of teaching experience, school location and early experiences of teachers. The content taught and how outdoor lessons are perceived by students was also investigated. The participating teachers reported that they teach an average of 18 minutes per week outdoors in the vicinity of their schools. It is clear that the location of the school and early experience have no statistically significant influence on the duration of outdoor lessons in the vicinity of the school, while statistically significant differences in the extent of outdoor learning near the school are found among teachers with different levels of experience. Slovenian teachers have ideas for outdoor lessons close to the school but also report difficulties in implementing such lessons. However, most of their ideas for outdoor activities fall within the thematic set Forces and Motion, while fewer ideas exist in terms of Humans. Students recalled that they had experienced outdoor lessons once or twice per school year and mostly remembered schoolyards, forests, and meadows as locations of their school-related outdoor lesson. They had ideas for the content of the outdoor lessons that could largely be implemented directly in Science and Technology lessons within the existing curriculum.

Due to the sampling procedure, generalisation of the research results regarding teachers is only possible to a limited extent. Although the questionnaire accompanied by a request to participate was sent to 451 of 455 Slovenian primary schools, only 70 teachers answered the questions of the e-questionnaire. Another limitation is that the students who responded were taught by 26 teachers not necessarily included in the research and from only six different primary schools. The location in which they could experience outdoor lessons may therefore be similar. The choice of instrument also partially limits the conclusions, partly because the questions were mostly closed-ended and that the open-ended questions were sometimes poorly answered.

The presented results of the study can be used by teachers to raise awareness of their own outdoor Science and Technology lessons, and to plan outdoor lessons, some of which could be designed together with students, thus strengthening their personal responsibility for the importance of their progress. The

results indirectly indicate guidelines for the preparation of materials, training and the encouragement of teachers to teach outdoors near their schools, taking into account all subjects in the educational process.

The responses to the research questions gave rise to many ideas for further research. It would be interesting to design specific teaching materials based on content for which teachers listed fewer ideas for outdoor lessons, and to include and evaluate the students' ideas. The comparison of activities and the organisation of outdoor lessons in urban or rural environments, research on the level of motivation, achievements and the attitudes of students towards outdoor lessons in the vicinity of the school, the extent of outdoor lessons through the stages of education in Slovenia, and similar are all topics that would be relevant for future qualitative and quantitative research and would provide specific guidance for improving outdoor lessons.

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## Biographical note

**Maruša Novljan** is the second teacher of the first grade in Nove Jarše Elementary School. Aware that outdoor lessons have a positive effect on students and their holistic development, she has prepared a master's thesis in this field. Even as a class teacher, she strives to conduct outdoor lessons in the school's surroundings as often as possible.

**Jerneja Pavlin**, PhD, is an Associate Professor of Physics Education at University of Ljubljana, Faculty of Education, Slovenia. Her research focuses on the investigation of different approaches to physics and science teaching (e.g. outdoor teaching and learning, using 3D sub-microscopic representations, didactic games, learning by inquiry, peer instruction etc.), aspects of scientific literacy and the introduction of contemporary science into physics teaching. She is involved in several research projects in the field of science and physics education (e.g. NA-MA POTI, AR Physics made for students, Movement-dance stories in connection with science and social sciences in kindergarten and school, Connectedness with nature, the organization of early school-aged students' free time and digital technologies).