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ENVIRONMENTAL AWARENESS, ATTITUDES, AND BEHAVIOUR OF PRESERVICE PRESCHOOL AND PRIMARY SCHOOL TEACHERS

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Introduction

The modern lifestyle is marked by various environmental problems such as climate change, the greenhouse effect, water scarcity and water pollution, waste disposal, loss of biodiversity, overpopulation, ozone depletion, depletion of natural resources, environmental noise and light pollution, deforestation, acid rain etc. (Carta et al., 2018; IPSOS, 2019; IRP, 2019).

Global warming currently has an enormous impact on the entire planet. Human activities, primarily fossil fuel burning contribute to the increase of heat-trapping greenhouse gas levels in the Earth's atmosphere (NASA, 2021) which leads to an increase in the global average temperature. This significantly contributes to climate changes that are also characterised by rising sea levels, sea acidification, ice loss at the Earth's poles and in mountain glaciers, extreme weather events, vegetation cover changes, biodiversity loss and habitat degradation (National Academy of Sciences, 2020). The other important environmental issue is water-related problems. Since 2012, the water crisis has consistently ranked as the highest concern. Global water resources are under increasing pressure from population and economic growth, changes in production and trade patterns, rapidly growing demands, and climate change (Ercin, 2018; UNESCO, UN-Water, 2020;). Water scarcity and pollution limit the provision of quality water to meet human, environmental, social, and economic needs. Water pollution can be caused in a number of ways including substances from waste. Due to economic and population growth and urbanisation, the amount of waste is increasing rapidly. Waste accumulation and inappropriate waste management contribute to the change in environmental conditions and processes (Ferronato & Torretta, 2019; IRP, 2019), and have a negative impact on human and other life as well. One of the greatest threats is air pollution caused by solid or liquid particles and certain gases suspended in the air, such as sulphur dioxide, nitrogen dioxide, carbon monoxide, volatile organic compounds (VOCs), and particulate matter (PM). Primary pollutants are emitted directly into the air by industrial, domestic and traffic sources, while secondary pollutants (such as tropospheric ozone) forms when primary pollutants react in the atmosphere. Air pollution affects human health and contributes to global warming, acid rain, smog, ozone depletion etc. One of the more serious consequences of human activities is



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Abstract. *Environmental education represents an important factor in solving environmental issues and teachers have an important role in developing the environmental literacy of future generations. The aim of the present research was to assess and compare preservice preschool and primary school teachers' environmental awareness, attitudes, and behaviour, as well as their opinions about environmental education. The research was carried out with 152 Slovenian preservice teachers of the Faculty of Education, University of Primorska. The data were collected using a questionnaire. Results showed that students have a relatively high level of environmental awareness and mostly demonstrated a positive attitude towards nature and its protection. Students highlighted the importance of environmental education in early childhood. The research showed no significant differences in the responses of students of both programmes in general, which indicates that the course contents have a less significant influence on students' awareness, behaviour, and attitudes. According to the findings, there is a need for an improved course within the teacher training programme, especially with the implementation of more innovative teaching methods and activities to increase students' environmental literacy.*

Keywords: *environmental attitudes, environmental behaviour, environmental awareness, preschool education, primary school education, university students*

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soil pollution. Soil acts as a “universal sink” and can accumulate or even concentrate contaminants which further affect the environment and human health (Ashraf et al., 2014). The major causes of soil pollution are agriculture, industry, waste disposal, mining, and atmospheric deposition (Cachada et al., 2018). Human activities (agriculture, land-use change, roads, mining, overgrazing, deforestation...) have also intensified soil erosion (Jenny et al., 2019) resulting in the loss of fertile land, increased pollution and sedimentation in streams and rivers, reduction of the productivity of ecosystems, and impacts on climate and biodiversity (IRP, 2019).

The last 50 years of scientific research have created greater awareness of the complex environmental problems and confirmed the need for urgent action (Burke et al., 2017; Valavanidis, 2019; WHO, 2020), such as international cooperation, interdisciplinary research, advanced technology and management tools, successful environmental policies, effective strategies for sustainable development, an increase in public awareness and the improvement of environmental education.

Research Focus

In response to the growing environmental crisis, developing environmentally literate citizens is crucial to understanding and overcoming environmental problems. Environmental literacy is a precursor for effective environmental protection (Kaya & Elster, 2019; Keinonen et al., 2016) and it could be achieved through environmental education. Effective education enhances environmental awareness, attitudes, values, and knowledge, as well as develops skills that prepare individuals to collaboratively undertake positive environmental action and responsible behaviour regarding the environment (Aminrad et al., 2013; Ardoin et al., 2020). It is important to raise the environmental literacy of children from an early age representing a critical period for developing thinking, behaving and emotional well-being (Türkoğlu, 2019). Several studies (Ardoin et al., 2020; Cohen & Horm-Wingerd, 1993; Meier & Sisk-Hilton, 2017) provide evidence of strongly positive outcomes in early childhood environmental education, such as an improvement in children’s environmental awareness and knowledge, and positive attitudes towards the natural environment. In this context, teachers have a great responsibility and important role in providing adequate environmental literacy (Boca & Saraçlı, 2019; Türkoğlu, 2019), in a way that takes into account the child’s developmental needs, interests, and abilities. According to Lwo et al. (2017), teachers influence a child’s conception of the environment and play an important role in identifying and correcting misconceptions related to environmental problems (Yalcin & Yalcin, 2017). To achieve a positive impact on future generations, high-quality environmental education starting from preschool age is crucial.

Because of the important role of the teacher, many studies (Goulgouti et al., 2019; F. Sadik & S. Sadik, 2014; Tuncer et al., 2010) indicated a need to improve preservice teachers’ environmental literacy. In this regard, understanding their perceptions about the environment could lead to more effective environmental education and greater levels of environmental literacy (Keinonen et al., 2016). Therefore, in this research the following components of environmental literacy of preservice teachers were assessed:

- (1) *Environmental awareness* - fundamental knowledge of local and global environmental issues, and awareness of consequences (risk perceptions),
- (2) *Environmental attitude* - attitude refers to values and feelings of environmental concern and motivation to active participation in environmental improvement and protection (UNESCO, 1978); value the interaction of human beings with the environment and their responsibility for environmental problems (Alvarez-Garcia et al., 2017),
- (3) *Environmental behaviour* - individual behaviour that is respectful of the environment in everyday life, as well as participating in pro-environment actions (Alvarez-Garcia et al., 2017); this component is formed by consumption patterns, individual conservation, environmental activism, and leisure involving nature (Negev et al., 2008).

Research Aim and Research Questions

Many studies have examined the environmental literacy of preservice teachers, but there is a lack of research comparing the environmental literacy of preservice preschool and primary school teachers in the literature. Accordingly, the aim of the present research was to assess preservice preschool and primary school teachers’ environmental awareness, attitudes and behaviour, and to find their opinions about environmental education in order to enrich the existing environmental education teacher training course.



The research questions guiding this research were:

- What is the level of environmental awareness of preservice teachers?
- What are preservice teachers' attitudes and behaviours towards the environment?
- What are preservice teachers' opinions about environmental education?
- Is there any significant difference between preservice preschool and primary school teachers' environmental awareness, attitudes, and behaviours?

Research Methodology

General Background

In line with the aim of this research, a quantitative research was designed. The questionnaire was administered to the students of the Faculty of Education, University of Primorska (Republic of Slovenia), enrolled in the Preschool and Primary school teaching programme. The Preschool teaching programme is a first-degree programme, which lasts 3 years. The aim of the programme is to train preservice teachers for quality educational work with children in early childhood (between the ages of 1 and 6) and to work with their parents, colleagues, and other professionals. The Primary school teaching programme lasts 5 years: 4 years in the first-degree and 1 year in the second-degree programme. The major goal of the first-degree programme is to develop the preservice teachers' knowledge and pedagogical skills for teaching all subjects in primary school (students between the ages of 6 and 11). The research was carried out during the 2018/2019 and 2019/2020 academic years.

Sample

Convenience sampling was used in this research. This sampling approach was adopted due to its easy access for data collection. The sample consists of 152 undergraduate students who study at the University of Primorska, Faculty of Education. Of the 152, 90 (59.2 %) were Primary school teaching programme students and 62 (40.8 %) were Preschool teaching programme students, both groups of the second study year. Slovenia has three faculties of education, with an annual enrolment of 215 students in the Primary school teaching programme and 175 students in the Preschool teaching programme. The number of participants in this research represented approximately one-third of the average population of students enrolled in the second study year of both programmes.

The sample included students who have already attended the science course. Preservice primary school teachers learn about environmental issues mainly within mandatory science courses in the second year of study. The environmental education in the Preschool teaching programme is carried out mainly in the second year of study within the elective and the mandatory science course. The mandatory course of the Preschool teaching programme includes less environmental content in the curriculum (only some topics) in comparison with the Primary school teaching programme. For this reason, the participants were selected from the second year of study, after they took the environmental education within science courses.

The age of participants ranged between 20 and 22 years old. Most of the participants in both groups were females (preservice preschool teachers: 97.5 % females, 2.5 % males; preservice primary school teachers: 93.3 % females, 6.7 % males), which reflects the current state of the gender distribution of preschool and primary school teachers in Slovenia (preschool teachers: 97.3 % females, 2.7 % males; primary school teachers: 87.2 % females, 12.8 % males) (Statistical Office of the Republic of Slovenia, 2019). The socio-economic status of the students in both groups were similar. The participants were coming from different Slovenian regions.

Instrument and Procedures

The questionnaire was developed in order to gather the data. The questions and items were written in accordance with the aim of the research, some of them were adapted from relevant reviewed studies about university students' attitudes and behaviour towards the environment and environmental education (Alagoz & Akman, 2016; F. Sadik & S. Sadik, 2014; Slimak & Dietz, 2006). The questionnaire was divided into three parts: (a) the first part was used to assess students' environmental awareness, (b) the second part was used to explore students' environmental attitudes and behaviour, and (c) the third part was used to find out the students' opinions about environmental education.



The first part included 3 open-ended questions and the scale consisted of 30 statements. Through the questions, the students' opinions on global and local environmental problems, and activities necessary to solve these problems were provided. A 5-point Likert-type scale with a list of 30 environmental issues was prepared. Students expressed their opinions about what environmental risk these issues pose. In the scale responses ranging from 1- *no risk* to 5- *very big risk*. The Cronbach's alpha value of the scale was .910. As stated by Nunnally (1978), the reliability of 70 or better can be accepted, so the results show that this part of the questionnaire is reliable.

In the second part of the questionnaire students' environmental attitudes and behaviour was explored using a 5-point Likert-type scale with 22 statements. The first set of 8 statements related to the attitudes towards nature (interaction of human beings with nature) and responsibility for environmental issues. With the second set of 14 statements about pro-environment actions in everyday life students' environmental behaviours were assessed. The responses ranged from 1- *strongly disagree* to 5- *strongly agree*. The mean values of the scales were presented for each statement. According to Veisi et al. (2018) mean values ranging from 1 to 2.49 are defined as a negative attitude, from 2.50 to 3.99 as a moderate attitude, and values from 4 to 5 as a positive attitude. The reliability of this scale is acceptable, as a Cronbach's alpha value ($\alpha = .716$) higher than .70 was determined.

The third part of the questionnaire was focused on environmental education as teachers have a crucial role in promoting environmental literacy. Four questions were prepared to identify: students' opinions about the societal level of environmental literacy, what sources of information students assessed as the most reliable, what importance they attributed to environmental education at school, and whether they had acquired sufficient environmental knowledge at the faculty. For the first three questions, 4- and 5-point Likert-type scales were prepared. The last question was a close-ended question, with yes or no response.

The content validity of the questionnaire was examined and verified by an expert in science education who had more than 15 years of research and teaching professional experience. Based on suggestions for improvements of the questionnaire, some items were corrected. Then, the questionnaire was administrated to a pilot group ($N = 32$). After completing the questionnaire, the participants were asked to point out any ambiguities or difficulties they had experienced in completing the questionnaire. Considering their comments, the questionnaire has been adapted and the final form was designed.

Before administering the questionnaire, the participants were informed about the purpose of the research. Anonymity was guaranteed and any information that could reveal the identity of participants was avoided. The questionnaire was distributed to the students during the course. The students voluntarily participated in the research. Participants took approximately 15–20 minutes to complete the questionnaire.

Data Analysis

The quantitative data obtained from the questionnaire were analysed using SPSS statistical software (version 26.0). The answers for each statement of the 4- or 5-point Likert-type scale were rated with the corresponding number of points. To describe data for each statement of the Likert-type scale descriptive statistics were used: the measure of central tendency (M) and the measure of variability (SD). The reliability of each scale was determined using Cronbach's alpha coefficient. The qualitative data obtained from an open-ended question were firstly reviewed and then categorised in response categories. For each response category the measure of frequency ($f, f\%$) was determined (how often the response was given). The normality of data was tested and in accordance with the results, the parametric t -test was used to determine the differences in environmental awareness, attitudes, and behaviour between the preservice primary school and preschool teachers. As stated by Sullivan and Feinn (2012), for better interpretation the substantive significance (effect size) and statistical significance (p value) are essential results to be reported. Therefore, an effect size analysis was conducted, and Cohen's d value was calculated. The value of .20 is referred to a small effect, .50 to a medium effect, and .80 to a large effect size (Cohen, 1992).

Research Results

Students' Environmental Awareness

As seen in Table 1, the students of both groups highlighted climate change (54.6 %), waste problem (42.8 %), air pollution (33.6 %), water pollution (32.2 %), and pollution in general (31.6 %) as the most important global environmental issues. The other global environmental issues mentioned by the students are deforestation, ozone



layer depletion, biodiversity loss due to habitat destruction, traffic, excessive use of non-renewable resources, a lack of drinking water, ice melting, acid rain, soil pollution, intensive agriculture, population growth and urbanisation. Some students are convinced that oil spills, invasive species, GMOs, natural disasters, light and noise pollution are important environmental issues in the world. On a local scale, students thought that in Slovenia the most important environmental issues were the waste problem (27.0 %), pollution in general (26.3 %), climate change (19.1 %), air (13.8 %) and water pollution (9.9 %). No statistical difference between groups was found.

Table 1

Students' List of the Most Important Global and Local Environmental Issue (N = 152)

Environmental issue	Global scale		Local scale	
	<i>f</i>	<i>f</i> %	<i>f</i>	<i>f</i> %
Climate change	83	54.61	29	19.08
Waste problem	65	42.76	41	26.97
Air pollution	51	33.55	21	13.82
Water pollution	49	32.23	15	9.87
Pollution in general	48	31.58	40	26.32
Deforestation	32	21.05	1	.66
Ozone layer depletion	24	15.79	-	-
Biodiversity loss and habitat destruction	16	10.53	-	-
Traffic	15	9.87	4	2.63
Excessive use of non-renewable resources	14	9.21	4	2.63
Lack of drinking water	13	8.55	1	.66
Ice melting	12	7.89	-	-
Plastics	10	6.58	2	1.32
Acid rain	9	5.92	2	1.32
Soil pollution	6	3.95	-	-
Intensive agriculture	5	3.29	2	1.32
Population growth and urbanization	5	3.29	-	-

The students assessed the environmental risk of 30 selected environmental problems. The results are presented in Table 2, separately for students of the Preschool teaching programme and students of the Primary school teaching programme. The preservice preschool teachers rated the following human activities as the top five riskiest for the environment: activities leading to water scarcity and degradation of water quality, emissions of freons and halons which cause ozone layer depletion, hazardous waste, traffic, and plastic pollution. According to preservice primary school teachers, the human activities leading to water scarcity and degradation of water quality, global warming, plastic pollution, ozone layer depletion, and deforestation represent the most important environmental risks.

Preservice preschool teachers perceived the following environmental risks as the least threatening: overgrazing, sport fishing and hunting, spreading the invasive species, pollution with nanoparticles, and human population growth, while preservice primary school teachers chose overgrazing, sport fishing and hunting, damming rivers, nanoparticle pollution, and activities contributing to erosion and soil degradation.

There was no statistical difference in the opinions about environmental risks between preservice preschool and primary school teachers, except in their opinions about traffic ($t = -2.945, p = .004$), indoor air pollution ($t = -2.479, p = .014$), and damming rivers ($t = -2.596, p = .011$), where statistical differences were found. Although statistically



significant differences in the mentioned three risks were found, it can be deduced from the Cohen's d value that the effect size is medium (traffic: $d = .506$) or small (indoor air pollution: $d = .398$; damming rivers: $d = .435$).

Table 2

Preservice Teachers' Perception of Environmental Risks Caused by Human Activity (1- no risk, 5- very big risk)

Environmental risk	Preschool ($N = 62$)		Primary School ($N = 90$)		t-test		Cohen's (d)
	M	SD	M	SD	t	p	
Water overuse and pollution	4.65	.630	4.58	.719	-.612	.542	.104
Emission of greenhouse gasses	4.37	.814	4.50	.691	1.020	.310	.172
Emission of freons and halons	4.52	.620	4.36	.798	-1.393	.166	.224
Plastic pollution	4.40	.839	4.40	.776	-0.024	.981	.000
Hazardous waste	4.45	.717	4.32	.668	-1.139	.256	.188
Deforestation	4.24	.824	4.33	.764	.702	.484	.113
Heavy metal pollution	4.27	.793	4.26	.829	-.139	.890	.012
Persistent organic pollutants	4.31	.801	4.17	.838	-1.029	.305	.171
Traffic	4.44	.716	4.04	.860	-2.945	.004	.506
Destruction of habitats	4.18	.758	4.18	.728	.003	.998	.000
Depletion of natural resources	4.06	.885	4.23	.835	1.195	.234	.198
Activities causing biodiversity loss	4.00	.768	4.13	.837	1.013	.313	.162
Inadequate disposal of medicinal waste	4.23	.913	3.94	.826	-1.941	.055	.333
Use of plant protection products	4.13	.914	3.97	.741	-1.160	.248	.192
Untreated waste water	3.81	.920	3.89	.929	.540	.590	.087
Emission of sulphur and nitrogen oxides	3.81	.743	3.79	.786	-.138	.890	.026
Overfishing	3.66	.940	3.80	.950	.888	.376	.148
Indoor air pollution	3.98	.967	3.57	1.092	-2.479	.014	.398
Human population growth	3.56	1.050	3.80	1.051	1.358	.177	.133
Activities causing eutrophication	3.68	.845	3.70	.785	.167	.868	.025
Wetland destruction	3.77	.931	3.61	.920	-1.069	.287	.173
Light and noise pollution	3.76	.953	3.62	1.023	-.838	.403	.142
Oil drilling	3.82	.859	3.53	.914	-1.964	.051	.327
GMOs	3.66	.809	3.52	1.073	-.910	.364	.147
Activities contributing to erosion	3.65	.770	3.47	.902	-1.308	.193	.215
Invasive species	3.31	1.018	3.63	1.022	1.942	.054	.314
Nanoparticles	3.52	.763	3.43	.887	-.615	.540	.109
Damming rivers	3.66	1.039	3.23	.937	-2.596	.011	.435
Sport fishing and hunting	3.00	.975	2.96	1.101	-.256	.798	.038
Overgrazing	2.76	1.066	2.80	.985	.249	.803	.039



The third question of the questionnaire focused on the activities that students believed were important for solving environmental problems. According to the students from both groups (Table 3), the most important activities were proper waste treatment (40.8%), environmental education (38.2%), using public transport or riding a bike (24.3%), and organising environmental protection activities (23.0%). They also pointed out the need for adequate environmental policy and legislation (8.6%), a reduction in the use of fossil fuels (8.6%), reducing the amount of plastic (6.6%), water-saving (6.6%), lifestyle changes to preserve the environment (6.6%), reducing the emissions of greenhouse gasses (5.9%), and energy-saving (5.3%). No statistical difference between groups was found.

Table 3

Preservice Teachers' Suggestions for Activities to Solve Environmental Problems (N = 152)

Activities	<i>f</i>	<i>f%</i>
Waste management (reduction, sorting, recycling, wastewater treatment)	62	40.79
Learning about environmental issues	58	38.16
Use of public transport or riding a bike	37	24.34
Organising activities for environmental protection	35	23.03
Adequate environmental policy and legislation	13	8.55
Use of renewable sources/reduction of fossil fuel	13	8.55
Less packaging, less plastic	10	6.58
Water-saving	10	6.58
Lifestyle changes to preserve the environment	10	6.58
Reduction of greenhouse gas emissions	9	5.92
Energy-saving	8	5.26

Students' Environmental Attitudes and Behaviour

As seen in Table 4, students showed a positive environmental attitude (mean values from 4 to 5), except for the last statements about the role of science and technology in solving environmental problems. There were no significant differences in the attitudes towards nature and environmental responsibility between students of both programmes. Mean values indicated that with most of the statements the preservice preschool teachers expressed greater agreement than the preservice primary school teacher (Table 4).

With the second set of statements about pro-environment actions in everyday life students' environmental behaviours were assessed. A higher mean value represented more sensitivity to the environment. Results indicated that students expressed the highest agreement with the statements about supporting the use of renewable energy sources, reducing waste volume and recycling waste (Table 4). Students from both groups expressed the lowest agreement with the statement about reading articles related to environmental issues and active participation in environmental protection activities. There were no significant differences between groups, except with the statement "*I have paid attention to my consumption habits in order to contribute to environmental protection.*" ($t = -2.878$, $p = .005$), but the effect size was slightly under the limit value which determines the medium effect size ($d = .475$).



Table 4*Preservice Teachers' Environmental Attitudes and Behaviours (1- strongly disagree; 5- strongly agree)*

Environmental attitudes and behaviours	Preschool (N = 62)		Primary School (N = 90)		t-test		Cohen's (d)
	M	SD	M	SD	t	p	
I like being in nature because I relax.	4.73	.577	4.67	.540	-.637	.525	.107
Protecting nature is important to me.	4.61	.583	4.46	.737	-1.467	.145	.226
Nature must be preserved primarily due to plants, animals, bacteria, viruses and fungi, and not just for the well-being of people.	4.53	.783	4.48	.796	-.417	.677	.063
I believe that environmental problems will only intensify.	4.42	.615	4.32	.776	-.858	.392	.143
Industry should be required to use recycled material, although it may cost more than production from new raw materials.	4.27	.793	4.37	.771	.718	.474	.128
As an individual, I can greatly contribute to the preservation of the environment.	4.16	.872	4.11	.917	-.338	.736	.056
I think people in developed societies should adopt a more conservative way of life to solve environmental problems.	4.03	.905	3.92	.824	-.764	.446	.127
The development of science and technology will eliminate environmental problems.	2.16	.853	2.31	.816	1.092	.277	.180
I support the use of renewable energy sources.	4.71	.584	4.68	.650	-.316	.753	.049
Before I discard packaging, I reduce its volume.	4.60	.735	4.54	.823	-.411	.682	.077
I regularly recycle waste.	4.39	.797	4.19	.982	-1.370	.173	.224
When I go to the store, I take a shopping bag with me.	4.26	1.007	4.21	.954	-.292	.771	.051
I switch off electrical appliances if I am not using them.	4.05	1.078	3.88	1.216	-.910	.365	.148
In the winter I'm careful not to heat my home more than necessary.	3.82	.933	3.98	1.101	.936	.351	.157
I have paid attention to my consumption habits to contribute to environmental protection.	3.74	.808	3.34	.876	-2.878	.005	.475
I give preference to biodegradable products from non-degradable.	3.65	1.057	3.37	.977	-1.646	.102	.275
I give preference to recyclable products from non-recyclable.	3.65	1.026	3.32	.958	-1.959	.052	.332
If possible, I choose a bike ride or public transport instead of driving a car.	3.53	1.036	3.30	1.434	-1.159	.248	.184
I always warn people if they are doing damage to the environment.	3.39	.981	3.46	.926	.437	.663	.073
I'm willing to pay more for environmentally friendly products.	3.39	1.014	3.24	.998	-.861	.391	.149
I actively participate in environmental protection activities.	3.13	1.109	2.98	1.060	-.842	.402	.138
I read articles related to environmental issues.	2.50	.919	2.43	1.006	-.423	.673	.073



Students' Opinions about Environmental Education

The third part of the questionnaire was dedicated to the collection of students' opinions about environmental education. The first question aimed to find out what sources of information about environmental issues students assessed as the most reliable. The students expressed their opinion about each selected source with responses ranging from 1- *the least reliable* to 5- *the most reliable*. In Table 5 the mean value and standard deviations for each source are presented. Results showed that preservice primary school teachers thought that the education system was the most reliable source of information ($M = 4.46$), while family ($M = 3.09$) and friends ($M = 2.72$) were the least reliable sources. The preservice preschool teachers considered books to be the most reliable information source ($M = 4.35$) and friends as the least reliable source ($M = 2.90$). According to the results of the *t*-test, it was determined that there was a statistically significant difference between the two study programmes with regard to students' opinions about the education system as the most reliable sources ($t = 1.993, p = .049$). The Cohen's *d* value indicated a small effect size ($d = .344$).

Table 5

Preservice Teachers' Opinions on the Reliability of Information Sources about Environmental Issues (1- the least reliable, 5- the most reliable)

Information sources	Preschool (<i>N</i> = 62)		Primary School (<i>N</i> = 90)		<i>t</i> -test		Cohen's (<i>d</i>)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	
Education system	4.21	.832	4.46	.603	1.993	.049	.344
Books	4.35	.851	4.26	.815	-.719	.473	.108
State institution	3.92	.874	3.90	1.006	-.123	.902	.021
Local institution	3.90	.783	3.76	.952	-1.045	.298	.161
Voluntary organisations	3.82	.915	3.81	1.253	-.062	.951	.009
Radio, TV	3.40	.914	3.40	.922	-.021	.983	.000
Magazines, journals	3.31	.951	3.37	.893	.398	.691	.065
Internet	3.21	.994	3.11	.988	-.602	.548	.101
Family	3.21	.926	3.09	1.013	-.748	.456	.124
Friends	2.90	.953	2.72	.972	-1.137	.257	.187

In the next question, students were asked to express their opinions on the environmental literacy of various generations (primary school students, faculty students, their parents, their grandparents). As seen in Table 6, students estimated themselves as having the highest level of environmental literacy, while their grandparents had the lowest. There was no statistical difference in students' opinions between groups and Cohen's *d* values showed a small effect size.



Table 6*Preservice Teachers' Opinions on Environmental Literacy (EL) in our society (1- low, 4- very high)*

EL of different generations	Preschool (<i>N</i> = 62)		Primary School (<i>N</i> = 90)		t-test		Cohen's (<i>d</i>)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	
EL student's self-assessment	3.02	.496	3.06	.568	-.736	.463	.075
EL of faculty students	3.00	.512	2.94	.548	.761	.448	.113
EL of parents	2.85	.596	2.89	.771	-.307	.760	.058
EL of primary school students	2.74	.676	2.60	.667	1.282	.202	.208
EL of grandparents	2.66	.767	2.44	.937	1.563	.120	.257

The next question on the questionnaire was focused on environmental education in school. Students' opinions on three statements regarding the importance of environmental education are presented in Table 7. Students of both groups expressed the highest agreement with the statement about the importance of environmental education in the preschool period. There was no statistical difference between groups and Cohen's *d* values showed a small effect size ($d = .219$). They also expressed a high level of agreement with the other two statements about the positive effect of environmental education on a respectful attitude to nature and knowledge about environmental issues, but there was no difference between groups.

Table 7*Preservice Teachers' Opinions on Environmental Education (1- strongly disagree, 5- strongly agree)*

Statement about environmental education	Preschool (<i>N</i> = 62)		Primary School (<i>N</i> = 90)		t-test		Cohen's (<i>d</i>)
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>p</i>	
Environmental education is important already in the pre-school period and then during schooling it has to be upgraded.	4.60	.778	4.74	.464	1.340	.184	.219
Environmental education contributes to becoming more respectful of nature.	4.35	.726	4.34	.737	-.086	.932	.014
Environmental education in school influences the later understanding of environmental issues.	4.26	.767	4.31	.744	.427	.670	.066

The last question aimed to find out whether the students had acquired sufficient environmental knowledge. The majority of students from the primary school education programme (43.3 %) thought that they acquired enough knowledge, while the majority of the students from the preschool education programme (40.3 %) thought the opposite. Many students were unable to assess whether they had acquired sufficient environmental knowledge at school or not.

Discussion

For the participants in this research the most important environmental issues in the world were climate change, waste problems, air and water pollution (Table 1). That is in accordance with the results of the Ipsos global survey about the top global environmental issues in 2019 (Ipsos, 2019), which are the biggest challenges of the twenty-first century posing risks to the environment and human health. Air pollution and climate change were also identified as the world's biggest environmental problems by preservice teachers in the research done by Alagoz and Akman



(2016). As reported by Kukkonen et al. (2012), university students perceived climate change and a lack of clean water as the most serious environmental problems. The present research revealed that the majority of participants also indicated the waste problem as the major local environmental problem in the Republic of Slovenia (Table 1). This students' opinion was expected because recently special attention has been dedicated to the two national biggest hazardous waste management companies and to the waste management system which is predominantly decentralised and organised at the municipal level. This issue was also widely reported in newspapers and other mass media. Similar global and local environmental problems as mentioned above have been highlighted in several studies (Keinonen et al., 2016; Kukkonen et al., 2012; F. Sadik & S. Sadik, 2014), but listed in a different order of importance due to the characteristics of the specific country and education system where the research took place. The results also depend on the time (year) when the survey was conducted as the environmental topics change daily (Aydin, 2010) and of the mass media influence on environmental issue perceptions of all society, especially young people and children (Keinonen et al., 2016; Matyjas, 2015). The perception of environmental issues contributes to a better understanding and higher awareness of environmental hazards and the negative consequences of anthropogenic activities. Therefore, in this research students' risk perception (awareness of consequences) on 30 environmental problems were analysed. According to the students, the highest environmental risk was the overuse of water resources and water pollution. The results may reflect the fact that water pollution and the problem of water scarcity are important learning topics in many curricula of Slovenian primary and secondary schools leading to the high awareness of water issues. Moreover, they indicated global warming, emissions of freons and halons, hazardous waste, traffic, plastic pollution, and deforestation as very important environmental risks. Some risks such as overgrazing, sport fishing and hunting, nanoparticle pollutions were estimated as less important risks, likely due to a low level of knowledge about these risks. Therefore, environmental education must provide knowledge and awareness about current and especially lesser-known environmental issues. Despite the different curriculum no significant difference in the level of environmental risk perception (Table 2) between students of the Preschool teaching programme and students of the Primary school teaching programme was detected. However, some statistical difference between groups was observed in their opinions about traffic, indoor air pollution, and damming rivers. Durmuş-Özdemir and Şener (2016) found a significant positive relationship between the students' environmental education and their environmental risk perceptions. The importance of education in understanding various environmental risks and raising awareness on the environmental issue was also confirmed by several studies (Alagoz & Akman, 2016; Carmi & Alkaher, 2019; Ergin, 2019). Students need to be aware of environmental problems in order to understand and solve them (Metin et al., 2011). In accordance with the prevailing opinion of students on the most important global and local environmental issues, the majority stressed the importance of proper waste management as the most effective activity for the solution of environmental issues (Table 3). They also indicated the environmental education as an important way to overcome environmental problems, also confirmed by several previous studies (Alagoz & Akman, 2016; Türkoğlu, 2019). Environmental education significantly affects the prevention, control, and elimination of environmental risks (Hesami Arani et al., 2016). In the present research, many students viewed public transport as an activity which could mitigate environmental issues. This result has been expected since Slovenia has an extremely high share of private cars in passenger transport, which is the most unsustainable mode of transport (Kušar et al., 2014). In addition, students suggested other solutions to environmental problems such as environmental protection activities, adequate environmental policy and legislation, use of renewable sources, and reduction in fossil fuel usage, greenhouse gas emission, and plastic, conservation of water and electricity, and lifestyle changes.

In order to study the students' environmental attitudes and behaviours (the second part of the questionnaire), they were asked to indicate their views on selected statements using five-point Likert scales (Table 4). The statements which received the strongest agreement (in both groups) regarding environmental attitudes were *"I like being in nature because I relax."* and *"Protecting nature is important to me."*, that is in accordance with the findings of Koc and Kuvac (2016). On the other hand, students from both groups expressed the lowest agreement with the statement about the development/progress of science and technology as the remedy to environmental problems (Table 4). A possible reason for this can be their own experience and online information regarding the negative impact of technology (such as non-ionising radiation, information security threats, technostress, etc.). Rapid progress in the science and technology has significantly improved the quality of our lives (improvement in healthcare, communication, energy supply ...), although there is also some negative impact on our lives and surroundings. For example, technology contributes many solutions to environmental issues, but it also represents part of that problem (Proudfoot & Kelley, 2017). The contrasting roles of science and technology in environmental challenges



have been widely discussed by Voulvoulis and Burgman (2019), who highlighted the importance of integrated, interdisciplinary and holistic solutions, and a better definition of environmental problems.

Students from both groups expressed the strongest support for the use of renewable energy sources because non-renewable energy releases greenhouse gasses and other pollutants into the atmosphere causing global warming and climate change which was perceived by the students as the most important global environmental issue (Table 1). Similarly, as in the case of students' estimation of the impact of human activity on the environment, there were no significant differences between the results of students from both groups, with the exception of the statement "*I have paid attention to my consumption habits to contribute to environmental protection.*" ($t = -2.878, p = .005$).

The research revealed that for the preservice primary school teachers, the most reliable sources of information about environmental issues were the education system, and books for preservice preschool teachers (Table 5). The statistically significant difference between groups is likely due to the different courses of Primary and Preschool teaching programmes. Keinonen et al. (2014) also found that students perceived school/education as the most reliable source of information concerning environmental issues. The present research also shows that local and state institutions and voluntary organisations are important factors that awaken environmental awareness for the majority of students. The latter indicates the important influence of the growing role of non-state actors on students' opinions on environmental status. For the participants of this research, the internet and TV were moderately reliable information sources, however, other studies (Kukkonen et al., 2012; F. Sadik & S. Sadik, 2014; Yurttaş & Sülün, 2010) have shown that internet and TV were considered the most important factors that awaken environmental awareness. Besides the important influence of school, institutions and media, children also acquire information about environmental issues from friends and family. Nevertheless, the development of behaviour and skills, awareness and sensitivity towards the environment begins with the attitude of parents (Halmatov & Ata, 2017), the participants assessed family and friends as the least reliable sources of information, likely due to the greater influence of other sources in the period of the early adulthood. This is in accordance with the research done by Keinonen et al. (2014).

As environmental literacy is assumed to be an important prerequisite for environmental protection and conservation, the students' views on the levels of environmental literacy in our society were collected. According to the findings, students rated themselves as the most environmentally literate individuals, while they assessed their grandparents at the lowest level (Table 6). This is mostly due to the different lifestyles and living conditions of previous generations. The economic conditions, education and information level, social status, location of residency, political ideology and the government's environmental regulation information, and environmental pollution as well, significantly contribute to public attention to the environment (Üstün & Celep, 2007).

The results of this research revealed that the majority of students were aware of the importance of environmental education in the preschool period (Table 7), but preservice primary school teachers indicated a higher level of importance than preservice preschool teachers. According to Buldur and Ömeroğlu (2018), childhood is a period of very intense development during which attitudes and awareness are formed and developed. The preschool period is crucial because in this period the attitudes of individuals towards the environment are created (Wilson, 1996). Students of both programmes strongly agreed that environmental education contributes to becoming more respectful of nature and also influences a later understanding of environmental issues and attitudes towards the environment in the later period.

Preservice primary school teachers thought that they had received sufficient environmental knowledge during schooling, while preservice preschool teachers believed that they were not informed enough about the environmental topic. The reason for this is most likely in the previously described difference in courses of both programmes.

This research has some limitations. First, the sample size was small ($N = 152$), because this research was carried out only in one university with an annual enrolment of 60 students at preschool teaching programme and 60 students at primary school teaching programme. Therefore, the results cannot be generalized. For future research, more students should be involved in the sample, not only from Slovenia but also from other countries. Second, this research compared only environmental awareness, attitudes, and behaviours of preservice teachers, but the environmental knowledge as an important component of environmental literacy was not assessed. In future work, it will be meaningful to examine the environmental knowledge of the preservice teachers. Finally, the participants may have completed the questionnaire superficially and did not devote sufficient time to a thorough reading and reflection on each statement or question.

Nevertheless, the findings should contribute to future research about the environmental literacy of preservice teachers. Additional research on environmental awareness, attitudes, and behaviours of preservice preschool and



primary school teachers including a comparison with the other countries, could help to design an effective course of environmental education for preservice teachers who are important predictors of environmental literacy of future generations. It is important to highlight the significance of monitoring the effectiveness and efficiency of environmental courses and realising continuous evaluation of them.

Conclusions and Implications

The present research gives insight into the preschool and primary school preservice teachers' environmental awareness, attitudes, and behaviours. Findings from the first part of the questionnaire showed that the students are mostly aware of the major global and local environmental problems. The highest perceived environmental risks were the overuse of water resources and water pollution. As the most effective activities to solve the environmental problems students highlighted waste management and environmental education, while energy-saving was on their opinion the least important.

Results indicate that students from both groups showed a positive attitude to the natural environment and a great concern for environmental protection. On the other hand, the majority of students specified the lowest level of agreement with the statement about the development/progress of science and technology as the remedy for environmental problems. So, there is a need to improve communication and explanation about the role of science and technology in our lives.

Analysis of results regarding environmental behaviour indicated that students from both groups expressed the strongest support for the use of renewable energy sources. The research revealed that the most reliable sources of information about environmental issues are the education system and books. In the case of the education system, a statistically significant difference between the groups was detected. Students found the internet and TV to be a moderately reliable source, while family and friends were the least reliable. The majority of students considered themselves more environmentally literate than their parents and grandparents. Students are aware of the importance of environmental education from an early age and its contribution to environmental awareness, behaviour, and attitudes of the citizens.

There were no important differences in the responses of students from both programs in general, which indicates that the course contents have a less significant influence on students' awareness, behaviour, and attitudes. This is probably because the course is based mostly on theoretical knowledge about environmental issues. In order to educate more environmentally qualified and conscious teachers, it is important to enrich and improve the environmental education teacher training course to provide teachers with the necessary knowledge, competencies, skills, tools, models, and examples of good teaching practices. It is essential to implement more innovative teaching methods and activities to increase students' interest, knowledge, and sensitivity towards environmental problems, such as (1) inquiry-based learning with hands-on activities to develop critical and creative thinking skills, (2) outdoor learning to foster sensitivity and respect for nature, (3) experiential learning, (4) project work focusing on local topics, (5) discussions about the current environmental problems, with an emphasis on expressing their opinions, personal ideas, and suggestions for solving these problems, (6) cross-curricular evaluation of environmental problems, (7) activities to engage students in environmentally responsible behaviour and healthy lifestyles, (8) involvement of scientists, experts, and local institutions in environmental learning. Besides that, the society needs to be aware that environmental problems are not country-specific, as many environmental problems extend across national borders. Currently, the Earth is facing several environmental issues that require the efforts of all countries of the world. International actions and agreements have already been very effective in reducing acid depositions and protecting the ozone layer. Similarly, some networks, such as Global Environmental Education Partnership (GEEP, 2021) and Foundation for Environmental Education (FEE, 2021), have been already designed to strengthen environmental education on a global scale. However, there is a necessity for more targeted international cooperation to achieve environmental education objectives. In this regard, a network of faculties of education and other educational institutions needs to be set up to support the preservice teacher's professional development by promoting their environmental literacy and training them for better environmental teaching.

The analysis of preservice teachers' environmental literacy represents an important basis for the improvement of the environmental education courses at the faculties of education. So, this research should be upgraded by cross-country analysis of the preservice teachers' environmental literacy, whereas there are variations in the educational system and environmental policies among countries.



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