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Environmental literacy comparison between eco-schools and ordinary schools in Slovenia

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Abstract
The aim of environmental education is environmental literacy which includes not only knowledge but also awareness and environmentally responsible behaviour. This study included pupils who are provided environmental education as part of the curriculum during regular class hours, as well as those who are included in the Eco-school project. The aim of the study was to determine whether there were any differences between the two groups of pupils regarding their knowledge, awareness and environmentally responsible behaviour, and whether more extensive knowledge of environmental issues is related to greater awareness and environmentally responsible behaviour. Our research was based on a questionnaire (test of knowledge and opinion scale) drafted especially for the purposes of the study. Statistical comparisons of the results of the tests of knowledge showed that the knowledge level is slightly higher in eco-school pupils than in pupils attending only regular class hours. On the other hand, the results of the research indicated that as regards pupils' awareness and environmentally responsible behaviour, the differences between the two groups are not statistically significant. Based on these findings, it may be concluded that environmental knowledge does not result in greater awareness and environmentally responsible behaviour. As regards the Eco-school as a Way of Life project, it can be determined that the project raises only the level of knowledge, but fails to produce the desired results in terms of a more responsible way of life.

Key words: *Environmental education, eco-school, environmental literacy, knowledge, awareness, responsible behaviour, factor analysis, discriminatory analysis.*

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Introduction

Environmental literacy and environmental education

Roth (1992), Harvey (1976) and Orr (1992) treated the notion of environmental literacy and defined it as knowledge of how the world functions and how humans can preserve and sustain the environment. In pedagogical terminology, this means that environmental literacy has content, skills and processes that learners have to know and be able to do, to enact or to demonstrate.

The origin of the concept of literacy lies in Saussure's theory of language as a constructed system of signs, and from semiotics – the science of signs. Insofar as the features of the physical word reveal themselves through the signs we attribute to them, it could be said that we read the environment through our understanding, which is socially and cultural conditioned. In practice, some definitions of environmental literacy rely directly on these readings. For the Kachana Pastoral Company (Kachana website), environmental literacy is the skill to read new and existing "sign-posts and maps" that tell us where we stand (in ecological terms). Stables and Bishop (2001) distinguished between weak and strong conceptions of environmental literacy. Weak conceptions are many times ill-defined subsets of environmental education, often dealing with aspects of it that lie outside the field of environmental action. Coyle (2005) defined three levels of environmental literacy. The first level is environmental awareness; the second level is environmental knowledge, which involves a combination of awareness and action called personal conduct knowledge (e.g. saving electricity, water and gasoline, buying green products); and the final level is environmental literacy, which is distinct from the second level because of its depth of information and actual skills. For the strong conception of environmental literacy, Stables and Bishop suggested a broad view of literacy, which allows us to consider the environment as a text. This view has long-term consequences: for example, the sense we make of our environment comes in many forms; there are many different ways of understanding the environment, and the distinction between reacting (reading-knowing) and acting is blurred. The final conclusion of this argumentation is that environmental literacy is broader than environmental education, to such an extent that literacy could be education's final goal. This understanding of environmental literacy is incorporated in the Benchmarks for Environmental Literacy Project (SAGEE, 2008), which defined environmental literacy in three fields: knowledge, skills and habits of mind. The final scope is action – the things we do as consumers, producers and voters. In this regard, Benchmarks explicitly mentions that the goal of environmental education is to develop an environmentally literate citizenry. Likewise, the definition of an environmentally literate person by the Environmental Education and Training Partnership organisation states that *he/she knows what he/she is willing to do, and he/she know haw to do it* (EETAP.ORG, 2008). We can infer that a strong conception of environmental literacy includes knowledge (facts, concepts, skills) and action. The field of action is also framed by attitudes and awareness, which all together shape a person's behaviour.

In this paper we will use the term *knowledge* as content knowledge (empirical knowledge – facts and scientific rationality – way of thinking). We define environmental awareness as knowing the impact of human behaviour on the environment and a kind of sensitivity to what happens in the environment. In this sense awareness has both a knowledge-based (cognitive) component and a perception-based (affective) component.

As far as knowledge is concerned, we can also find a connection between science education and environmental education. Although environmental education is essentially cross-curricular, science education has an important part to play in developing an understanding of the scientific principles that underpin environmental issues. Thus science education in general is a prerequisite for environmental literacy. Moreover, scientific literacy overlaps in some of respects (Mathews 1997, Littledyke 2008) with environmental literacy. In other words it is difficult to establish a sharp distinction between both because they are interrelated. That is why Littledyke highlighted the need for constructive post-modern science education to integrate affective and cognitive domains as a suitable model for integration of both educational fields.

Because we are dealing with environmental education and its relation to eco-schools, it is worth clarifying, at least for the purpose of this paper, the term "eco" in connection with education. From a historical perspective, awareness about human impact on the environment (with emphasis on the natural environment) was first expressed as ecological problems and then the term "ecological education" was used. Sund and Wickman (2008) described this as a fact-based tradition where environmental issues were ecological issues and environmental problems were based on a lack of knowledge and were to be solved by science. Later in the 1980s, ecological problems became more related to people's lifestyles and values, and the terms "environmental education" and "environmental literacy" emerged. In the 1990s, environmental problems were viewed as moral and political problems that science alone cannot solve. In this tradition, environmental education moved farther from science towards the whole spectrum of social and economic development, and has recently been replaced (see the special issue of *Environmental Education Research*, 2008) with the concept of education for sustainable development. Teachers and researchers often use these terms interchangeably; even Orr in his work does not distinguish between the terms *environmental* and *ecological* (cited in Cutter-Mackenzie and Smith, 2003). Regardless of this development, "eco" remains a strong label for all kinds of products and activities (e.g. eco-schools) which are engaged with environmental problems and nowadays also with sustainable development.

Environmental literacy between knowledge and pro-environmentally behaviour

The environmentally literate person is therefore equipped with appropriate knowledge, is environmentally aware and behaves pro-environmentally. The latter depends on the combination and interrelations of knowledge (concepts, skills), awareness, attitudes, values and other social, cultural and psychological factors. Researchers in this field (social and behavioural sciences) often have not found a direct relation between attitudes, awareness and behaviour, and the causality between these factors was found to be weak. To explain these obstacles to pro-environmental behaviour, a few theoretical models have been developed (see overview in Kollmuss and Agyeman, 2002), but the question is too complex to explain it with a single model. The oldest and the simplest models were based on a linear progression from environmental knowledge to awareness and concerns, which led to pro-environmental behaviour. These models were soon proven wrong; although they are still widely present in common wisdom. More elaborate and complex models included other factors that influenced behaviour. The theory of reasoned action is based on the assumption that people act rationally. This is why they drive cars, although they are aware of climate change. Psychological and sociological models use different internal (personal) factors and external factors. In internal factors, Kollmuss and Agyeman (2002) included motivation, environmental knowledge, values, attitudes, environmental awareness, emotional involvement, locus of control and responsibility, and priorities. External factors are

represented by institutional factors, economic factors and social and cultural factors. They claimed there is no direct relationship between knowledge and pro-environmental behaviour:

"We see environmental knowledge, values and attitudes; together with emotional involvement, as making up a complex we call 'pro-environmental consciousness'. This complex in turn is embedded in broader personal values and shaped by personality traits and other internal as well as external factors." (Kollmuss and Agyeman, 2002, p. 256).
One critique of this modelling approach to resolve the gap between knowledge and behaviour is by Courtennay-Hall and Rogers (2002). They have argued that "shaping human behaviour" as a fundamental aim of environmental education is in contradiction with at least the last 50 years of debate on educational goals. This "behaviouristic" approach is bypassing students as thinking beings, capable of making their own decisions about what constitutes responsible environmental behaviour. Courtennay-Hall and Rogers emphasised the importance of critical thinking and action competence, rather than environmental behaviour.

According to Courtennay-Hall and Rogers (2002), the gap between environmental knowledge and environmental action may be seen as a specific variety of the more general gap between knowledge and action. Throughout history numerous philosophers, politicians and religious leaders have engaged with this phenomenon. For research purposes, it is most suitable to look at individual phenomena – individual knowings – and individual behaviours (importance of case studies) to understand the gap between what people know and what they are willing to do. Recently Van Petegem, Blieck and Van Ongevalle (2007) described a new perspective on this complex relationship, in which environmental concern influences behaviour indirectly. Specific variables, costs and social relations need to be taken into account as they interact with values and beliefs. They explain that a personal belief is more likely to be converted into action if this involves little cost in time and effort, or if this action serves the person's needs directly. Heimlick and Ardoin in their review on *Understanding Behaviour to Understand Behavioural Change* (2008) mentioned the Hines model. The Hines model, based on behavioural change also focuses on additional conditions, including personality factors, knowledge of issues and possession of skills for taking action. All of these elements interact in an intention to act, but the ultimate behaviour is triggered by situational factors.

It has been about 20 years since the appearance of more complex models of change in environmental behaviour that challenged the simple linear model leading from knowledge to behavioural change. But the perception is still spread among many educators that telling someone to behave in a certain way and also giving a reasonable and understandable explanation will cause a change in his or her behaviour – in other words, that teaching behaviour is possible. This is the point of departure for our assumption that, while eco-school programmes have brought a fresh approach to environmental education and deeper knowledge, individuals as regards behaviour are not all alike; they are not motivated by the same things, they are not equipped with the same skills and they do not possess the same attitude and awareness.

Eco-Schools International Programme
Eco-Schools International Programme operates in the framework of the Foundation for Environmental Education (FEE), a non-governmental organisation bringing together national non-governmental organisations and implementing programmes for environmental education, management and certification. FEE's seat is currently in Portugal (www.eco-school.net).

The main principle of the programme is that eco "thinking" should become a way of life. Pupils should develop a positive attitude towards the environment, taking into account both humans and nature. In this way future consumers, manufacturers and those involved in the decision-making process would become more sensitive to the environment. Implementing comprehensive environmental education within the international eco-school project may be considered to some extent as a reform or modernisation of the school system. New, up-to-date issues are included in the class work, whereas the learning process consists of action and problem-solving. The project is based on the principles of interdisciplinarity (combining natural sciences and sociological subjects to fully understand each aspect of a particular issue), a comprehensive and systematic approach (considering the complexity of environmental problems), activities (orientation towards the future, finding and defending different ideas, taking into account the needs of future generations), connecting real local environmental problems and global environmental issues (developing a sense of priority in dealing with environmental problems: local – national – global environmental problems), and playing an active role in democratic decision-making on environmental issues by combining cognitive, emotional and aesthetic aspects.

Have these approaches and strategies been realised, and do these efforts actually produce results in schools – do they lead to the final goal of environmental literacy? The study by Mogensen and Mayer (2005), *A comparative study on the eco-school development process in 13 countries* is based on a qualitative research approach. It gave us a lot of interesting information and triggered new ideas about how to improve and develop eco-schools but it didn't answer the question.

Eco-schools in Slovenia

The eco-schools in Slovenia were founded after initiatives from the Eco-Schools International Programme. Because of the clear and relative simple conditions for becoming a member of the eco-school programme, this programme soon became popular. In Slovenia the programme was developed under the title *Eco-school a Way of Life* and is supported by the Ministry of the Environment, Ministry of Education and Sport, and Ministry of Higher Education, Science and Technology. In the year 2005, 215 Slovenian schools participated in this project. The eco-school programme involves seven steps that any participating school should take: establishing an eco-school committee, conducting an environmental review, writing an action plan, monitoring and evaluation, curriculum work, informing and involving, and creating an eco-code. Successful schools are awarded the eco-school green flag. In the year 2005, 142 schools got this award, which is about 66%.

In the national evaluation study of eco-school projects (Pavšer, 2002).The research showed that pupils express only a small amount of readiness and eagerness to behave responsibly in the environment in order to save it (action competence), which is one of the main objectives of environmental education. The data acquired pointed out that less than 20% of eco-school pupils stated they had taken part in eco-school activities or the activities of another ecological movement, whereas as much as 44.1% of eco-school pupils (Eco-school activities in the school year 2001–2002) declared they had never taken part in direct environmental preservation activities. Of schools, 58.3% claimed that they have integrated environmental topics into science lessons, and 46.4% agreed that inquiry-based teaching is the approach that best meets the goals of environmental education.

As pedagogy educators and researchers, we are often in contact with teachers and students from Slovenian eco-schools, and for various reasons we also visit several eco-schools and

taste the atmosphere in these schools at least a few times a year. From these contacts we have formed a view which is not far from the picture that Mogensen and Mayer (2005) described in their study. We have noticed almost all the weak points that have appeared in other countries. The first arguments that are mentioned as obstacles are related to structural or technical matters and insufficient financial support. Some eco-schools experience obstacles related to bureaucracy. But there are other kinds of obstacles which are more substantial. Sometimes the broad and "idealistic" goals oriented towards establishing democratic decision-making competencies in students are in practice transformed into direct teaching and learning of predetermined behaviour. In some schools, programmes often put an emphasis on the technical aspects and on quantitative rather than qualitative results. These quantitative results (e.g. number of projects) are easily measurable, and the programme is transformed into an activism devoid of content. These schools joined the programme for the prestige it brings, not because they are really devoted to sustainable development or ecological preservation. Also, in Slovenia the programme is usually run by enthusiastic individuals rather than by the entire staff; as it is formulated in the study, "the main problem appears to be that of shifting from the level of personal involvement of a few teachers to extending the idea to the whole group".

In all other schools that are not included in the eco-school programme, environmental topics are introduced as a cross-curricular subject called environmental education. The subject environmental education has its own national curriculum and should be taught in lower secondary school. The general goals of the environmental education subject are to deepen knowledge about environmental problems, to develop skills for research and to develop awareness as a precondition for action and pro-environmental behaviour, which can again be framed as environmental literacy. But because of its status as a cross-curricular subject without teaching hours in the school syllabus and without educated and dedicated teachers, the realisation of the curriculum is completely in the hands of individual teachers, depending on how prepared they are to adopt their subjects to environmental education. In the majority of cases, environmental education is integrated into science lessons, and the emphasis is on knowledge (ZŠ Report, 2005).

Research problem

Our research was inspired by several observations that we collected from our experiences with eco-schools in Slovenia. We wanted to base our judgement about the poor results and ambitious goals of the Slovenian eco-school programme on more objective data. This is especially because the motto "Eco-schools as a way of life" promises more than the eco-flag award, which is quite easy to achieve: 66% of schools in 2005. We were wondering if these programmes lead towards deeper knowledge and pro-ecological behaviour. In other words, we wanted to find out whether the efforts applied to the eco-school project had had positive effects on environmental literacy. For the purposes of our research, we extracted from different definitions and explanations of the concept *environmental literacy* three common principles: knowledge, awareness and behaviour.

Three hypotheses were put forward:

- **H1:** Statistically significant differences in environmental knowledge exist between the control and experimental groups.
- **H2:** Statistically significant differences in environmental awareness exist between the control and experimental groups.
- **H3:** Statistically significant differences in pro-environmental behaviour exist between the control and experimental groups.

Measuring instrument

The hypotheses were tested by a survey questionnaire, drafted especially for the purpose of the research. It consisted of 45 questions, based on which the following three aspects were measured and assessed: knowledge (16 questions), ecological awareness (12 questions) and environmentally responsible behaviour (17 questions). The first third of the questions (testing knowledge) are part of the curriculum for the seventh and eighth grades of the nine-year elementary school. The questions are focused on biology, chemistry, physics and environmental education. For the purposes of the research, we used modified questions from the External National Examination. This part of the test consisted of three types of questions: first there were those verifying knowledge and understanding; second, there were questions assessing process skills; and finally we had open-ended questions that tested more complex conceptual knowledge. As regards the type of knowledge, the questionnaire mostly evaluated declarative knowledge. A sample item is "*What is the role of a car catalyser?*" (see appendix for the complete set of items). There were fewer exercises testing process knowledge or combined exercises checking both. The questionnaire as a whole required pupils to show some knowledge of facts, provide explanations, comments and conclusions, read from a graph and provide definitions. Knowledge was assessed mostly by objective and open-ended questions.

In the second and third parts of the questionnaire, the levels of responsible behaviour and awareness were tested in both groups by objective questions and scales. For the construction of the second third of the questionnaire, the staring point was the NEP scale (Thapa 2001; Lundmark 2007), but because NEP measures attitude or general environmental paradigm, it was too demanding for the age of the students in our sample. For the purpose of measuring awareness or sensitivity to environmental problems, we constructed a new questionnaire.

With these questions we wanted to find out how aware pupils are about everyday problems, if they follow the media, and how sensitive they are to changes on the local or global level. More than 10% were open-ended questions (*Where in your surroundings have you noticed pollution or destruction caused by humans?* See appendix for the complete set of items). Some of them were asked in order to determine concrete activities, while others were used to evaluate awareness. The rest of the exercises consisted mostly of closed-ended questions. The pupils were allowed to choose one out of at least four possible answers or rank them in order of importance.

The third part of the questionnaire consisted of statements about everyday behaviour, where students had to mark the frequency of action in a four-grade scale from never to always (*When shopping I pay attention to recycled products*. See appendix for the complete set of items). Here we were aware of the limits of making inferences from this kind of questioning. But we used the questions for their measurability, contrary to the criticism of Mogensen and Mayer (2005).

The questionnaire was tested in a pilot phase on a sample of students not included in the eco-school programmes. In the first part of the questionnaire about knowledge, we changed two questions which were too demanding.

Statistical analysis

The following measurement characteristics of the test were established: objectivity (it was assured in terms of survey performance and assessment of answers), reliability (the Cronbach Alpha score was 0.7729 for the entire measuring instrument) and validity (confirmed by

factor analysis). The results were analysed using the SPSS statistical program. First, descriptive statistics were performed. Thus we obtained the following parameters: mean, mode, median, standard deviation, standard error of the mean, as well as skewness and flatness factors. The Kolmogorov-Smirnov test was used to test the normality of distribution. The variables deviating were normalised using standard normal distribution. Furthermore, a factor analysis of numerical variables was carried out: correlation matrix, Kaiser-Meyer-Olkin and Bartlett's test, communality, total variance explained, component factor matrix, rotated factor matrix – varimax and oblimin with Kaiser normalisation, and analysis of the extracted factors obtained. The structural difference between the two groups was presented by descriptive statistics. The difference was determined by hypothesis test and discriminatory analysis.

Sample

The sample included 233 pupils attending five elementary schools in Ljubljana, the criterion being their geographical proximity. Three of the schools had already been included in the eco-school programme, meaning that in compliance with the curriculum they had been involved in various projects and activities linked to the environment and ecology, whereas two of them had not been involved in the project before. The control group comprised 97 pupils not included in the eco-school programme, while the experimental group consisted of 136 pupils included in the eco-school programme. In the school year 2004–05 they were all eighth-graders in the nine-year primary school. They were all of the same age and attended the same class; their schools were situated in the same town, and they were educated according to the same national curriculum.

Results

1. Knowledge

Discriminatory analysis detected only a small statistically significant difference between the knowledge of the two groups.

Table 1: Knowledge: comparison between control and experimental group

Item No.	Control group % correct answers	Experimental group % correct answers
1	73.2	81.6
2	72.2	74.3
3	2.1	17.6
4	15.5	32.4
5	47.4	58.1
6	35.1	61.0
7	39.2	20.5
8	85.6	83.8
9	9.3	36.8
10	77.3	87.5
11	77.3	65.4
12	3.1	2.9
13	30.9	29.4
14	40.2	42.6
15	18.6	21.3
16	41.2	39.7
average	**41.7**	**47.1**

The analysis showed a statistically significant difference in knowledge in the answers to questions 3 (Water washes out fertilised fields; therefore, the amount of minerals promoting algae growth increases in water. Is this good or bad? Explain why.) and 9 (Match the terms in the left column [genetics, ecology, evolution] with the correct definitions in the right column).

Differences in all other answers were slightly smaller (statistically insignificant) and were observed in favour of the experimental group in the answers to the following questions: question 4 – the pupils were asked to find among the listed organisms the largest oxygen producer in sea water; and question 6 – they had to put the elements of the food chain in the right order. Surprisingly, the control group was slightly better in question 7 – the pupils listed documents on environmental protection (e.g. the Kyoto protocol) and question 11 – if the speed of a car has any effect on air pollution.

One third of pupils in each group failed to give an answer to question 12, asking for an explanation of the algal bloom phenomenon in the sea. Almost one third of pupils in each group omitted question 3, asking why accelerated algae growth in waters is good or bad.

Given the fact that discriminatory analysis detected only a small statistically significant difference in knowledge between the two groups, the average score by pupil and the average of correct answers for both groups was calculated for the first part of the questionnaire. Pupil attending an ordinary school obtained average score 15.4 points, while an eco-school pupil got average score 17.1 points. Also the difference between correct answers between the two groups was in favour of experimental group (Table 1).Thus it may be concluded that the eco-school pupils' were in average slightly better in knowledge than their coevals. Moreover, a low frequency of answers was detected in questions assessing knowledge between control group.

2. Awareness

The study showed a low frequency of answers to the questions related to awareness. Almost half of the respondents proved to be passive observers of environmental problems and activities enabling them to reach their goals. About 10% of pupils per group failed to provide answers to all questions on awareness. It also seems that they are more locally aware than informed by the media about global problems. Illegal waste disposal is still problematic in Slovenia, and because more than half of Slovenia is covered with forests, they speak about the effects that air pollution and waste disposal has on woods, although the current problems are pesticides in the drinking water (items 17, 24, 26, and 28). They are aware that living conditions regarding the environment will be worse (item 19), but they express a kind of defensive position. In item 21, the majority of pupils from both groups espouse coexistence (peaceful relationship with others); among possible answers were the options *solidarity, non-violence, modesty, responsibility* and *being prepared for action.* Also indicative were the answers about what they hope for, what they expect from life (item 22), and by which means they will achieve this (item 23). The most popular answer was to be *healthy*; other possibilities were to live in a clean and organised environment, to be wealthy, to have a good job, to live in harmony with nature, and to have my needs corresponding to my possibilities. The answer *healthy* is very traditional and could be judged as a socially acceptable answer. Also the endeavours towards this goal (to live healthily – item 23) are words from the world of adults (I am studying) or are not really connected with item 22 (I do not leave waste around).

Table 2: Awareness: comparison between control and experimental group

Item No.	Control group Preferred answer	%	Experimental group Preferred answer	%
17	no answer	43.3	no answer	43.4
	illegal waste disposal	37.1	illegal waste disposal	43.6
18	c	43.3	c	38.2
	d	26.8	d	37.5
19	a	78.4	a	79.4
20	g	69.1	g	100.0
21	coexistence	30.9	coexistence	25.0
22	a	60.8	a	58.1
23	no answer	34.0	no answer	33.1
	I am studying.	23.7	I do not leave waste around.	14.7
24	b	44.3	e	48.5
25	sometimes	45.4	sometimes	34.4
26	no answer	39.2	no answer	33.1
	in the forest	19.6	in the forest	32.4
27	b	54.6	b	56.6
28	no answer	68.0	no answer	64.7
	ozone layer destruction	20.6	ozone layer destruction	20.6

Notwithstanding the differences in knowledge, the research showed that the differences in awareness between the groups were not statistically significant. In order to assess and compare the levels of awareness between the control and experimental groups, we examined the means of individual variables. No major deviations from mean values were detected among groups. As for awareness, the mean in ordinary schools was higher in 17 cases and in eco-schools in 21 cases.

3. Behaviour

Statistical analysis showed that the differences in behaviour between the two groups are not significant. It seems that the questions matched well with the pupils' everyday life, because the average rate of answers in this part of the questionnaire (assessment of environmentally responsible behaviour) was almost 100%. The answers of both groups were very similar, but there are some slight differences that merit comment. First, we are aware that this kind of questionnaire does not show us a real picture of pupils' behaviour. All numbers (frequencies) are at least partially greater because of the effect of what is socially accepted. This means that from this data we can infer this effect not only on behaviour, but also on awareness and to some extent on knowledge as well. Interpretation is even more difficult because of the contradictory answers of both groups. Looking at the data, the experimental group is behaving slightly more pro-environmentally, but not regarding transport (items 39 and 42) and shopping (item 44), which are crucial segments of pro-environmental behaviour. Another surprising answer is about taking part in organized action. About half the pupils from both groups never collaborate in any of the actions organized by their schools or local communities. Although not statistically proven, the level of responsible or pro-environmental

behaviour is a little higher in the experimental group, but from the raw data differences could also be seen from school to school. Pupils' answers to the questionnaire show us the differences between schools, what they emphasized, which projects they are developing, and if they focus more on waste, energy, climate change, natural environment or water, etc.

Table 3: Behaviour: comparison between control and experimental group

Item No.	Control group Preferred answer	%	Experimental group Preferred answer	%
29	Often	33.0	Often	33.8
30	Never	30.9	Never	36.8
31	Sometimes	25.8	Sometimes	42.0
32	Never	76.3	Never	64.7
33	Often	32.0	Sometimes	35.3
34	Sometimes	28.9	Often	29.4
35	Sometimes	30.9	Never	38.2
36	Sometimes	30.9	Sometimes	39.7
37	Never	55.7	Never	44.1
38	Often	32.0	Always	31.6
39	Often	39.0	Sometimes	36.0
40	Never	41.0	Never	50.0
41	Never	55.7	Never	45.6
42	Sometimes	38.1	Often	38.2
43	Always	26.8	Always	36.8
44	Sometimes	32.0	Sometimes	44.9
45	Sometimes	33.0	Always	43.4

The test analysis showed that eco-school pupils were on average better when it came to knowledge, although after having examined their sample structure, we found out that their overall grades, as well as grades in natural sciences (in the seventh grade) were on average higher in the control group. Considering this contradiction, it can be inferred that different approaches to class work may be taken in these groups, and above all that different knowledge and assessment criteria might be applied in the classroom.

The research confirmed the first hypothesis, namely that statistically significant differences in knowledge exist among pupils in the control and experimental groups, while it rejected the second and third hypotheses, which stated that statistically significant differences in environmental awareness and environmentally responsible behaviour exist between the groups.

Discussion

Some other researchers have found a positive relationship between environmental knowledge and environmental attitudes (Peer, Goldman, Yavetz 2007). Although the students' knowledge was limited, their attitude was positive but in this study the students were much older (first-year university students). For our research, findings from an Israeli national survey on environmental literacy (correlation between knowledge, attitude and behaviour) of sixth- and twelfth-grade students (Negev, Sagy, Garb, Salzberg, Tal 2008) are indicative. The researchers did not find a significant correlation between knowledge and behaviour. Their results suggested that the intended objectives of environmental education in Israel have not been achieved.

What we can conclude about the distinction in environmental literacy between the two groups in our research? Has the eco-school project produced positive results? It should be emphasised that the study proved a statistically significant difference in knowledge between eco-school and ordinary schools. This is without a doubt a good sign and proof that eco-school pupils have made greater progress in this field but fails to promote environmentally responsible behaviour – although a positive influence in this area can nevertheless be seen. Taking into account these findings, we can conclude that the state of environmental literacy in the Slovenian eco-schools included in the study is between the first and second levels according to Coyle (2005). The first level is environmental awareness, while the second level is a combination of knowledge, awareness and action called personal conduct knowledge. Furthermore, we can ascribe the same status to the schools from the control group (schools that have environmental education as a cross-curricular subject).

Therefore a question should be raised: namely, if the project *Eco-schools as a Way of Life* has reached its goals regarding environmental literacy. This should be the primary goal of the project. *The main principle of the project is that eco "thinking" should become a way of life. Pupils should develop a positive attitude towards the environment, taking into account both humans and nature. In this way, future consumers, manufacturers and those involved in the decision-making process would become more sensitive to the environment*. This statement implies that the way the school functions and how the general atmosphere in the school is simplify and enable pupils to overcome obstacles in the way of pro-environmental behaviour (Kollmuss and Agyeman 2002). Moreover, it implies that the organisation of *Eco-schools as a Way of Life* takes into account internal personal factors such as motivation, knowledge, values, attitudes and awareness, as well as external factors, including economic, cultural and social, that construct and shape environmental literacy in its broader meaning.

But the reality shows different picture. Data analysis (eco-school activities in the school year 2001–02) showed that the primary focus of eco-schools is still to organise activities which do not considerably change pupils' attitudes and behaviours (e.g. cleaning the surroundings, planting flower beds). We can interpret this approach according to Courtennay–Hall and Rogers (2002) as "behaviouristic", bypassing pupils as a thinkers and decision-makers and not developing them towards critical thinking and action competence. In many cases such activities (collecting waste, taking care of plants in the schools, etc.) are managed by teachers; they are organised top-down by "fiery souls" (Mogensen and Mayer, 2005) and thus they fail to encourage pupils to change their attitudes. Another surprising piece of information is that only a solid half of eco-schools incorporate environmental issues in all subjects, so the situation is more like in other schools (ZŠ Report), where environmental education is completely in the hands of teachers and their motivation.

It can be inferred that the green flag as a symbol of a successful eco-school is too facile and that the conditions (seven steps) for granting this award are too lax, being based more on writing declarations and plans, on occasional actions and some external visual effects rather than on developing an atmosphere of environmental awareness and pro-environmental behaviour. It may be concluded that, in spite of the adopted programme, eco-schools fail to fully achieve the general objectives of environmental education, namely teaching environmental issues stemming from the local environment in order to save it. These objectives can only be attained by way of realistic, active class work oriented towards problem-solving. With such an approach, environmental education has a chance to encourage action competence in pupils, which is the basis for developing different behaviours and attitudes.

Implications

How could environmental education in general schools and in special programmes like the eco-schools be improved?

1. Well defined programme

Quite a few researchers/authors have found that implementation of a good programme can lead to greater awareness and thus make environmental education more successful. Patrick Devine-Wright (Devine-Wright, Devine-Wright, Fleming, 2004) claims in his research that pupils who have attended a school with an organised and well-defined environmental education programme – what eco-schools should be – have reached a higher level of awareness than those who have not been involved in organised work in this area.

2. Development of critical thinking competence

A U.S. study (Ernst and Monroe, 2004) proved that environmentally oriented education present throughout the entire education process improves critical thinking in other areas as well. It was established that the curriculum as a whole should include activities of dealing with simple situations and artificial problems, which are then gradually applied to real issues. The outcome of such gradual and long-term development of critical thinking is much more successful than dealing with one-off situations on a particular topic. This is also in accordance with Courtennay–Hall and Rogers (2002), who emphasised the importance of critical thinking competence against environmental behaviour.

3. The role of experiential learning

Littledyke (2004) claims that teaching should be focused on achieving environmental education by understanding environmental issues, training in and through the environment. This should be accomplished by gaining direct experience resulting from actual work in the environment and by receiving education that will help preserve the environment and form the values and attitudes necessary to protect it. Education should include critical understanding of the impact of science on society. Therefore, it is important to systematically include environmental issues in class work.

4. Motivation

Gough (2002) recommends that environmental education consist of topics that children find interesting (animals, waste); this suggests a bottom-up organisation. Moreover, class work should be about concepts explaining the network of connections between causes and effects (goods – waste – energy). Empathy and care for animals and other living organisms should be fostered and (critical) thinking on appropriate measures promoted *(If you were president, what would you do?)*. Role-playing should be used to detect impacts and consequences caused by environmental problems. Environmental education in such form could serve as the basis for a scientifically, environmentally and ethically (morally) educated society.

5. The role of adults

Negev, Sagy, Garb, Salzberg and Tal (2008) brought out the important role of teachers or other adults who mediate children's relationship to nature and have a crucial impact on attitudes and behaviours. It is also important for parents to be involved in education. They should take time together with their children to focus on activities that teach a child to develop awareness and responsible behaviour towards the environment. It should not merely be about sorting waste or energy efficiency, but also about renouncing the desire for material gain, striving for a healthy lifestyle, doing exercises, and adopting a critical attitude toward

environmental "wounds", origins of pollution, consumption, spoiled individuals, etc. It is important to make children understand the meaning of leading an environmentally responsible life.

Our research accomplished the goals set. It is our hope that its results would make people think and be useful in evaluating the environmental education programme in both ordinary and eco schools. The eco-school project was the first step. It is now important to further consider and elaborate plans for greater efficiency and improvement of awareness and more responsible environmental behaviour in the long run.

Experience has taught us that the value of knowledge lies in its usefulness. Dealing with environmental issues in Slovenian schools helps broaden and deepen knowledge of the environment, but fails to encourage logical and knowledge-based reflection on the causes and consequences of human activities affecting the environment. Therefore, it is necessary to observe and think more, rather than simply to learn facts. It takes inspiration to do research – in other words, curiosity and creativity at the same time. In order to achieve better results in awareness and environmentally responsible behaviour, we should move from simple accumulation of knowledge to taking action. Positive examples, (ecological) trends and taking on values will play a crucial role.

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Questionnaire

What are your marks in science?
5 4 3 2 1

Do you take part in the activities of eco-school projects or in another eco-movement?
YES NO

1. What is the role of a car catalyser?
   a) to reduce noise
   b) to reduce fuel consumption
   c) to reduce air pollution
   d) other_____

2. What happens if we move larger amounts of animals or plants into a new environment?
   a) This is good for biological diversity.
   b) With this we enrich the food chain.
   c) We destroy the ecological balance.
   d) other_____

3. Water drains cultivated fields. As a consequence, water is reached by fertilisers which accelerate the growth of algae. Is this good or bad? Explain why.

4. Which of the following organisms is the biggest oxygen producer in the sea?
   a) shells
   b) plankton
   c) coral
   d) sea grass

5. Match the items.

A herbivore	1 micro-organism
B decomposer	2 chicken
C producer	3 caterpillar
D carnivore and herbivore	4 wheat

6. The items from No. 5 are organised in a food chain. Which combination is correct?
   a) A, B, C, D
   b) B, A, C, D
   c) C, A, D, B
   d) D, C, B, A

7. Do you know of any international agreement about environmental protection?
   a) No
   b) Yes (which one?) _____

8. What is the meaning of the concept “endangered species”?
   a) animals or plants which have lived in the past
   b) just a limited number of individuals of this species are alive
   c) this animal or plant has replaced other species
   d) other_____

9. Match the item with its explanation.

Genetics	science of relations between organisms in their environment
Ecology	science of life
Evolution	science of heredity
	science of the development of species
	science of environmental protection

10. Which are the optimal conditions for seed germination and plant growth?
    a) light and dry
    b) dark and dry
    c) light and wet
    d) dark and wet

11. What is the effect of driving a car fast on the environment?
    a) the environment is more polluted
    b) the level of pollution remains the same
    c) the environment is less polluted

12. Sometimes we can see the "sea blooming".
Explain what the meaning of "sea blooming" is.

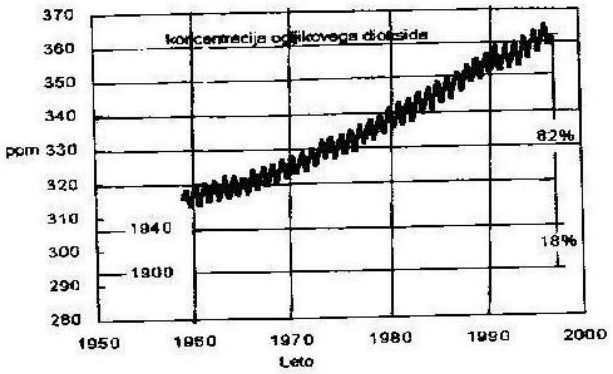
13. What is the main cause of acid rain?
    a) acids that evaporate in the air
    b) acids that are in wastewater
    c) gases which appear after burning coal or gas
    d) gases from refrigerators or air conditioning equipment

14. Match the items.

constant number of organisms in the environment	biodegradable material
relationship between guest and host	greenhouse effect
warming of the Earth's atmosphere	biological balance
material which can be decomposed by micro-organisms	population
	symbiosis

15. What is the meaning of the symbol?
    a) recycling
    b) put in the waste container
    c) compress the empty box
    d) included in the system of recycling
    e) green product

16. The graph illustrates the rise of carbon dioxide in the atmosphere. By how many units did the amount of CO_2 rise from 1980 to 1990?
    a) from 10 to 20 units
    b) from 20 to 30 units
    c) from 30 to 40 units
    d) more than 40 units



Awareness

17. Write down an example where have you noticed degradation of the environment.

18. Which of the following factors is most responsible for climate change?
    a) large amounts of municipal waste
    b) use of pesticides
    c) industrial waste and wastewater
    d) use of fossil fuels

19. What is your opinion about future living conditions on the Earth?
    a) will be worse
    b) will be the same
    c) will be better

20. Indicate the statements you do not agree with.
    a) We should put litter into a proper disposal.
    b) Only municipal authorities are responsible for waste.
    c) Waste sorting is easier if we put all different wastes in the same container.
    d) Cars with catalysers do not pollute the environment.
    e) Factories should have plants for cleaning wastewater and waste gases.
    f) On trips into the natural wilderness, we should carry waste with us.
    g) We can throw small amounts of pesticides or used paint into the wastewater system.
    h) Cleaning agents do not pollute water.

21. Put in order from the most important (1) to the least important (6).
    Coexistence
    Solidarity
    Non-violence
    Modesty
    Responsibility
    Readiness for action

22. Put in order from 1 (very much) to 6 (not at all) your hopes about life.
    a) to be healthy
    b) to live in a clean and organised environment
    c) to be wealthy
    d) to have a good job
    e) to live in harmony with nature
    f) that my needs correspond to my possibilities

23. Describe what you have done to reach the aims from item 22.

24. What do you think – how serious are some problems? Mark from 1, very serious, to 5, not important.
    a) air pollution
    b) water pollution, industrial wastewater
    c) food additives
    d) nuclear power plants, nuclear waste
    e) deforestation

25. How often do you think about environmental problems?
    a) often b) sometimes c) very rarely d) never

26. Describe what and where you have noticed degradation of the environment because of human actions.

27. What do you think – which measure is better?
    a) switching off lights when we do not need them
    b) using "green" light bulbs

28. Which of the following problems are the most threatening? Mark from 1 to 3.
    Ozone layer destruction
    Water and sea pollution
    Pesticides and other chemicals in food
    Deforestation
    Greenhouse effect
    Nuclear waste
    Acid rain

Behaviour

29. I put wastepaper, bottles, plastic boxes and other wastes each in a separate container.
    never sometimes often always

30. When I am brushing my teeth, I leave the water running from the tap.
never sometimes often always

31. Before putting it in the container, I reduce the volume of litter.
never sometimes often always

32. When shopping, I pay attention to products which can be recycled.
never sometimes often always

33. I know what to take out before opening the fridge.
never sometimes often always

34. I put all wastes in the same container.
never sometimes often always

35. I leave the light switch on even if no one is using it.
never sometimes often always

36. I use plastic shopping bags instead of paper ones.
never sometimes often always

37. I am active in different environmental initiatives.
never sometimes often always

38. When there is an option of shower or bath, I prefer a bath.
never sometimes often always

39. I prefer a bicycle rather than a car.
never sometimes often always

40. When the ground is full of rubbish, I throw litter on the ground too.
never sometimes often always

41. I read notices and leaflets about environmental protection.
never sometimes often always

42. If I have to go somewhere, I will ask my parents to take me by car.
never sometimes often always

43. If nobody is watching TV, I will switch it off.
never sometimes often always

44. I am buying products even if I do not need them.
never sometimes often always

45. When I am hungry, I first open the fridge and then decide what to eat.
never sometimes often always