

The Environmental Literacy of Lower Secondary School Pupils, High School and College Students

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Abstract: It is general known fact, the environment problems are still more and more serious. So the environmental education is the important way, how to learn pupils and students about environment and its protection. The main aim of the study was to find out the environmental literacy level of lower secondary school pupils, high school students and college students. Next the influence of age, gender, residence and other variables was determined. The samples size was created by 245 respondents. As the research tool was used Children's Responsible Environmental Behavior Scale (CREBS). The methods of descriptive (mean score, standard error) and inferential statistics (ANOVA) for the data analysis were used. The Cronbach's alpha was used for the determination of the reliability. The results showed relatively low level of environmental literacy. Higher level of environmental literacy had boys in comparison with girls, next respondents from village in comparison with respondents from town and also the oldest respondents.

Keywords: Environmental literacy, questionnaire, pupils, students.

INTRODUCTION

The environmental problems are still more and more serious. In the many countries of the world is situation still worsening due the continuing idleness and indifference of the people towards nature. The environmental education is one the way, how to learn learners about environment. The school is one of the best places for this activity (learning about environment). For the right behavior to the environment is important to have developed environmental literacy. It can consolidate the right attitudes and behavior of pupils and students toward environment. So the task of the school should be to create and develop the environmental literacy of pupils, because it is an investment in to the future.

THEORETICAL BACKGROUND

The creation of environmentally literate citizens is the basic goal of environmental education. In its earliest uses, the term literacy referred to the ability to read and write. In point of fact, the term "illiterate" occurred the positive term with respect to general literacy, as literacy, mathematical literacy, computer literacy, visual literacy, and so on [1]. The term "environmental literacy" was first coined by Roth [2], who identified the environmentally illiterate as the person who is the litterbug or the person who buys nonrefundable bottles. He also identified the environmentally illiterate as the person who pass home waste or industrial waste in rivers and builds noisy

polluting machines. He states that the "results of such illiteracy are rivers and lakes polluted beyond use; air rapidly becoming a hazard to health and in places a periodic threat to life". In the year 2008 Roth [3] connect the environmental literacy with environmental education: "The essence of environmental literacy is our response to the questions we learn to ask about our world and our relationships...environmental literacy demands understandings, skills, attitudes, and habits of mind Environmental literacy is the goal of environmental education. Environmental education is the processes by which people gain environmental literacy". Other authors defined environmental literacy as the understanding of the interactions between natural systems and human social systems [4, 5]. The environmental literacy has got very narrow connection with ecological literacy. Orr [6] defined ecological literacy "as a broad understanding of how people relate to each other and nature and the knowledge of how the world works as a system". The basic principles of ecology such as energetics, cycling, growth, and competition are the common factors in developing of environmental literacy [7]. It sounds; no formal universal definition exists for environmental literacy. Marcinkowski and Rehrig [8] and Simmons [9, 10] have identified general principles common to most environmental literacy definitions. These include environmental and ecological knowledge, clear positions on environmental issues, cognitive skills to analyze environmental problems, and behavior patterns that are designed to limit individual environmental impact or contribute to broader societal efforts to protect the environment. Hungerford and Volk [11] argued, the environmental literacy is basically different from other educational disciplines and it

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influences the behavior of the learners whose study it. Hungerford & Volk [11], Marcinkowski [12] and Simmons [10] wrote about three primary categories, whose are typical for environmental literacy: (a) knowledge, (b) attitudes, and (c) behavior.

CURRENT STATE

In the next lines are described the basic studies, which are focused on the environmental literacy. Erdogan, Ok and Marcinkowski [13] focused on the problematic of environmental knowledge, attitudes and skills. The sample size was created by Turkish lower secondary school pupils and authors stated, the good results in the attitudes and knowledge, but worse results in case of skills. Zecha [14] compared environmental literacy between German and Spanish students. The results show that there are cultural influences in the scales of knowledge, attitudes and actions. In both samples, the values in the knowledge scale were very low, however the Spanish students had worse results than the German students. The authors focused on the gender comparison, male students produce worse results than female students in both countries. Köse *et al.* [15] found out relatively neutral attitudes toward environment. The results were relatively interesting because all students were listeners of environmentally focused subject on their college. Morone, Mancl and Carr [16] found out minority respondents comparing with environmental health students indicate higher levels of concern about the environment, reflecting a more pessimistic view about environmental conditions. Minorities were also the most likely to pay attention to environmental issues reported in the media; however, they believed that they were not very knowledgeable about environmental issues. The same group of authors (Mancl, Carr, Morone [17]) found out the low environmental literacy citizens are less educated, below the median income, more likely to be female, older, and more likely to be a minority. Negev *et al.* [18] focused to evaluate their environmental literacy, including the dimensions of environmental knowledge, attitudes, and behavior. The authors did not find a significant correlation between knowledge and behavior. Ethnic and socioeconomic characteristics were moderately associated with environmental literacy, whereas the presence of an adult who mediated children's relation to nature was strongly related to environmental attitudes and behavior and weakly related to knowledge. Findings of Goldman, Yavez and Peer [19] indicated that graduates of the educational system who chose to

prepare themselves to be teachers were characterized by a low level of environmental literacy, as reflected in their environmental behavior: Students demonstrated limited performance of behaviors that require a high level of commitment, and hence, reflect a high level of environmental literacy, and visa versa. The results of Moody *et al.* [20] showed that students were enthusiastic about environmental literacy and that they welcomed increased knowledge about the environment. Bogan and Kromrey [21] found out, the college students had got relatively low knowledge of ecology, held a positive attitude towards the environment and knew environmentally responsible behaviors. Yavetz, Goldman and Peer [22] showed students towards the end of their studies reported increased involvement in most of the study's environmental behavior categories as compared to the beginning. However authors quoted, that students' environmental knowledge are low.

In this chapter are not mentioned all studies regarding to environmental literacy, but the trend is, that between knowledge and attitudes is relatively positive relationship and the knowledge of students are relatively low. The main amount of studies was realized at among university students.

AIMS AND RESEARCH QUESTIONS

The main of the study is to find out the level of environmental literacy at lower secondary school pupils, high school students and university students from Czech Republic.

The partial aims were to find out the influence of gender, residence, parents education on the level of environmental literacy.

The research questions were:

1. How is the level of environmental literacy at the lower secondary school pupils, high school students and university students from Czech Republic?
2. Is there any difference between boys and girls in the level of environmental literacy?
3. Has got the residence of respondents the influence on the level of environmental literacy?
4. Has got the parents education of respondents the influence on the level of environmental literacy?

METHODS

Participants

The sample size was created by 275 students, from this amount the lower secondary school pupils created 54 respondents, the students from high school created 179 respondents and rest was from college ($n = 42$). The number of girls was 213 and the rest was boys. The majority of respondents were from town ($n = 191$) and rest was from village. The age of respondents was between 12 - 41, the average age was 17.24.

Research Tool

The research was questionnaire created by Erdogan, Ok and Marcinkowski [13] called Children's Responsible Environmental Behavior Scale (CREBS). The first part of the questionnaire consisted of demographic variables (gender, age, residence, parental education). The second part consisted of 23 items focused on the activities regarding to protection of environment at last two years. Every item has got possibilities: 1. Never; 2. Once; 3. Twice; Three times; 4. Four times; 5. Five times; 6. More than five times. The items were divided into four groups: 1. Political activity; 2. Physical activity; 3. Economical activity and 4. Beliefs.

Administration of Research Tool

The administrators of research tools were teachers, whose were learned how to work with research tool. Students were assured, the research is anonymous. The average time for filling the questionnaire was approximately 20 minutes

Data Analysis

After obtaining questionnaires, they were coded following: never - 1;....more than five time - 6. The average score from the second part of questionnaire was as the dependent variable and demographic items were as independent variables. The methods of descriptive (average score, standard deviation) and inferential statistics (analysis of variance) were used for data analysis. The significance value was $p < 0.05$.

The reliability of questionnaire was secured by coefficient of Cronbach's alpha, which value for whole questionnaire was 0.80. It indicates high level of reliability. The values of alpha for the dimensions of questionnaire were following: 1. Political activity ($\alpha = 0.88$); 2. Physical activity ($\alpha = 0.75$); 3. Economical activity ($\alpha = 0.72$) and 4. Beliefs ($\alpha = 0.50$).

The respondents with score higher than $x = 4.50$ had got high level of environmental literacy, the respondents with score lower than $x = 3.50$ had got low level of environmental literacy and the respondents with score in interval $<3.50; 4.50>$ are neutral.

RESULTS

The overall score ($x = 3.08$; $SD = 0.96$) indicated the relatively low level of environmental literacy from the respondents of Czech Republic. When we look on the Figure 1, it is possible to see the students from university achieved the highest score, but their level of environmental literacy was neutral ($x = 3.76$; $SD = 0.14$), the other two groups had got low level of environmental literacy, the mean score of both groups was below 3.00. There were found out statistically significant difference ($F = 12.88$; $p < 0.05$). The Tukey post-hoc test showed statistically significant differences between university students and lower secondary school pupils and also between high school students and lower secondary school pupils.

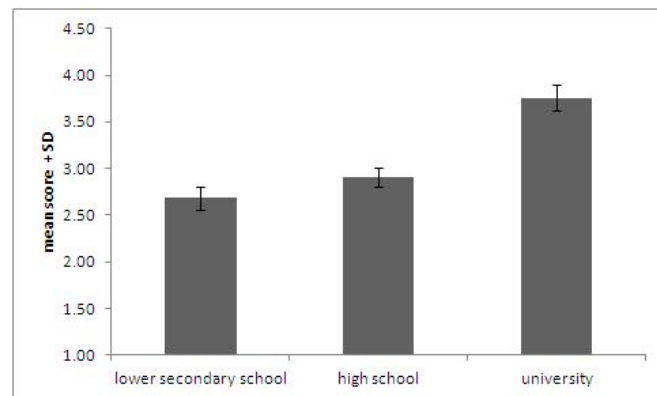


Figure 1: The mean score of respondents with respect to school.

As it is possible to see in Figure 2 nearly in all categories of environmental literacy university students achieved the highest score. Only in the category political activity was the score very similar for every observed group of respondents. However the score for the last dimension "political activity" was the lowest, so it means, the respondents conducted very low amount of activities regarding to political activity like visiting of city mayor. In the next step, the statistically significant differences in groups were found out. In the first dimension "physical activity" was identified significant difference ($F = 13.15$; $p < 0.001$), Tukey posthoc test showed statistically significant differences ($p < 0.05$) between all of groups. In the second dimension was also identified statistically significant difference ($F =$

17.99; $p < 0.001$). The Tukey posthoc test showed significant difference between university students and high school students and also between university students and lower secondary school students ($p < 0.05$). The similar results like in first category were observed in the third dimension, between groups of students was observed statistically significant difference ($F = 13.06$; $p < 0.001$) and also Tukey posthoc test showed significant difference between all of groups ($p < 0.05$), only in the last dimension was not found out statistically significant difference ($F = 0.71$; $p = 0.49$).

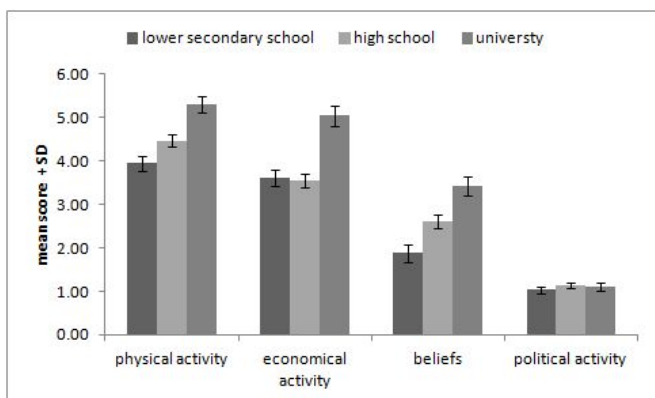
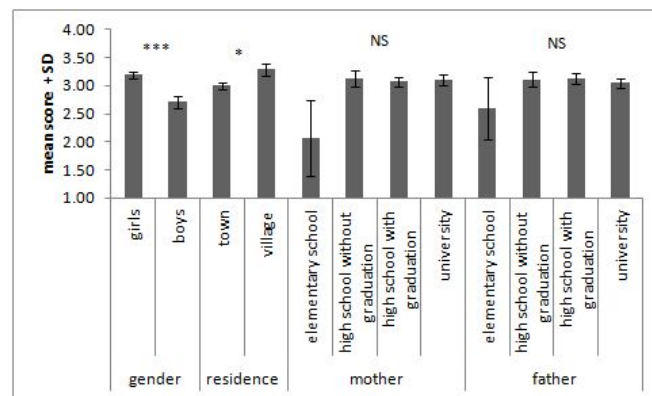


Figure 2: The distribution of score in the dimensions with respect to school, which is attended by respondents.

In the Figure 3 is possible to observe distribution of score in the groups of selected variables (gender, residence, educational level of parents). The gender had got the effect on the level of environmental literacy. The girls achieved higher score in comparison with boys, this difference in score was statistically significant ($F = 12.93$; $p < 0.001$). In the next variable (residence) was also identified statistically significant difference ($F = 5.44$; $p < 0.05$). The respondents from village achieved higher score in comparison with respondents from town. When the variable “mother educational level” was took into consideration the statistically significant difference was not found out ($F = 0.81$; $p = 0.49$). As it is possible to see.

The lowest score achieved respondents, whose mother finished only elementary school. The other three groups of respondents achieved similar score. The important point is, the all groups of respondents had got negative level of environmental literacy, their score was lower than 3.50. The similar situation was in the case of father educational level. The lowest score achieved the group, whose father finished only elementary school. The statistically significant difference was not found out ($F = 0.38$; $p = 0.76$). All

groups of respondents had got negative level of environmental literacy.



NS - non-significant difference

* $p < 0.05$

*** $p < 0.001$

Figure 3: The distribution of score with respect to gender, residence and parents educational level.

In the Table 1 are showed values for dimensions and values of ANOVA. The statistically significant difference was observed between boys and girls in the first and second category. The next statistically significant difference was observed between respondents from town and from village in the category “physical activity”. Only in very few categories was score over 4.50, which indicated the high level of environmental literacy, the majority was lower than 3.50, which indicated the low level of environmental literacy. It is possible to see relatively consistent results with respect to groups of variables. The lowest score is possible to observe in the category “political activity” in all groups, the also lower score is typical for the category “beliefs”. The highest score was detected in the category “physical activity”, where is possible to find the score, which indicated relatively high level of literacy, bit every value typical for high level of environmental literacy is boundary with neutral level of environmental literacy.

DISCUSSION

The investigation was focused to find out the level of environmental literacy of lower secondary school pupils, high school students and university students from Czech Republic, so the results are valid predominantly for the conditions of Czech Republic. Except of overall level of environmental literacy was the influence of gender, residence and parents’ educational level found out. The research was conducted through

Table 1: Distribution of Score in the Dimension with Respect to Gender, Residence and Parents' Educational Level and Values of ANOVA

	Physical activity	Economical activity	Beliefs	Political activity
Girl	4.67	3.94	2.70	1.14
Boys	3.93	3.30	2.25	1.06
F	7.78***	4.19*	2.13	0.37
Town	4.37	3.73	2.48	1.09
Village	4.80	3.94	2.86	1.18
F	5.98*	1.04	3.46	1.44
Elementary school	2.94	1.50	2.40	1.00
High school without graduation	4.71	3.77	2.58	1.06
High school with graduation	4.48	3.86	2.50	1.13
University	4.46	3.77	2.74	1.15
F	1.31	1.55	0.47	0.26
Elementary school	3.38	3.17	2.60	1.17
High school without graduation	4.63	4.01	2.40	1.07
High school with graduation	4.56	3.76	2.72	1.12
University	4.42	3.73	2.59	1.14
F	1.08	0.60	0.53	0.19

F - value of ANOVA; * $p < 0.05$; *** $p < 0.001$

anonymous questionnaire and as the pattern was used the questionnaire Children's Responsible Environmental Behavior Scale (CREBS) from Erdogan, Ok and Marcinkowski [13].

In the research world exists relatively low amount of sources regarding to problematic of environmental literacy, the majority of sources is regarding to problematic of attitudes toward environment. Toward environmental literacy we could find out the study from Erdogan, Ok and Marcinkowski [13], but this study is focused only on the development of the research tool. Other source regarding to, among others, problematic of environmental literacy was study from Mancl, Carr & Morone [17]. The results of this study showed relatively low level of environmental literacy. The similar results were found out also in our study, the students had got low level of environmental literacy. So the question is: "Why have got students so low level of environmental literacy". The response is possible to find out is also on school and also in out of school environment. The schools in Czech Republic do not educate learners in adequate form and do not provide possibilities, how to be environmentally useful. From this fact is arising the learners in many cases have not got an idea what they can do be environmentally useful, what they can do for to protect an environment. The problem is located probably in the curriculum, where the problematic of

environmental literacy is not so anchored and this problematic it is not main topic in the content of any subject in the curriculum of lower secondary and high school. Only the one group of respondents achieved relatively neutral level of environmental literacy. It can cause this, that older students (in comparison with lower secondary and high school students) are able to distinguish the environmentally useful behavior from the behavior, which could damage the environment. It is generally known, the education level on university is also regarding to environmentally topics, minimally in optional courses in every kind of university. When we look on the dimensions, it is possible to see, the pupils and students achieved relatively higher score in physical and economical activities regarding to environmental literacy. It means the pupils and students from time to time performed the activities like giving some money for environmental activities or they sometimes made some activities relating to protect animals and plants, and some respondents separate waste.

Next, the influence of different variables was found out to level of environmental literacy. First of them was gender, in our investigation the girls achieved higher score in comparison with girls. From available research studies, the similar results are possible to observe in the studies of Mderrisoglu & Altanlar [23], Zelezny,

Chua & Aldrich [24] and Zecha [14]. It can be caused by higher level of sensitivity and the feeling of responsibility to environment and nature. And maybe girls are aware the impact if relatively irresponsible behavior to environment.

The second variable was the residence of respondents; in our research the respondents from village achieved higher score in comparison with respondents from town. In the study of Mderrisoglu & Altanlar [23] was found out different result, respondents from town achieved higher score than respondents from village. Our results could be caused by, the respondents from village have got the more positive attitudes toward environment and nature in comparison with respondents from town. They have got more contacts with nature and they more often see the impacts of human activity on the nature. In the conditions of Czech Republic is possible to see, that many of companies (industry, agriculture) do not give their garbage on the official junkyard, but their garbage is exported on the illegal junkyard out of town, near the village. On the basis of this many people from village see the influence of this illegal junkyard on their life and it can be caused higher level of environmental literacy.

The last selected variable was parents' educational level. It was divided on the mother educational level and father educational level. In both cases was found out similar result, the respondents, whose parents had got finished only elementary education achieved the lowest level of environmental literacy, in other groups of variable was found out similar score. The answer on this question is probably, that parents behavior and education has got the direct influence on the behavior of their children. So if the parents, whose finished only elementary school and have got the low level of environmental literacy, so their children would be similar behavior and literacy. This is psychological effect, which is possible to see in some research studies (e.g. Hossler & Stage [25]).

CONCLUSION

The importance of the study is, that its using was first time in the conditions not only Czech Republic, but in the whole central Europe. So if the research tool was tested, we were trying to find out its behavior among lower secondary school pupils, high school students and university students. Every group of students showed valid and reliable results. The next important and interesting thing is, the all groups of students have got low resp. neutral level of environmental literacy. It can be caused by low level of this kind of literacy by

other factors, like school system, family, friends, etc. The most important finding is that Czech pupils and students have got the low level of environmental literacy, so we suggested in previous lines, where could be problem. Maybe the change of educational system could be lead to better situation in the progress of environmental literacy. Maybe the inclusion of some optional courses in the conditions of lower secondary and high schools could lead to the progress. And minimally one compulsory seminar on every kind of faculty could also cause the higher level of environmental literacy.

Our research provides the possibilities for the further investigations. We investigated only four variables (type of school, gender, residence, parent's educational level), there is possible to investigate more variables and also the combination of variables. In the sample size is possible to incorporate also the citizens, not only students.

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