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Examination of secondary school children's environmental attitudes

György Kónya

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University of Sopron
Faculty of Forestry

Gyula Roth Doctoral School of Forestry and Wildlife Management
Head of the Doctoral School: Prof. Dr. Sándor Faragó, Professor

Forestry and Environmental Education Program
Head of program: dr. Katalin Molnár, Associate professor

Supervisors: Tamás dr. Horváth, Assistant professor
Ibolya dr. Markóczi Revák, Assistant professor

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1. Timeliness of the topic

Examination of students 'environmental consciousness and environmental attitude has become the topic of an increasing number of publications. The protection of our environment, the natural habitats of plants and animals and reduction of environmental pollution are gaining a major role in our everyday life. Today's school children play an important role in establishing sustainability, thus much more attention needs to be paid to environmental education. Environmental education is a joint responsibility of the educational system and society. Its arenas and methods are varied and diverse both internationally and in Hungary. It can take place in school classes as well as in an interdisciplinary form, within the framework of extracurricular in-school and out-of-school activities. School children's everyday experience and influences exerted by society are also important contributing factors. One of the determining venues of environmental education is the forest school. With their content and diversity these activities complement the teaching-learning process at school. Environmental education helps children form an attitude that harmonises with the natural environment, develop a healthy lifestyle, and consequently, shape attitudes that prioritise natural, social and cultural values (Kováts-Németh, 2010). Forest school pedagogy plays a major role in shaping environmentally conscious behaviour. In Hungary the theoretical and practical implementation of the Forest (school) project began in 1996. This project provides a scheme that promotes the organisation and implementation of activities dealing with environmental education in- and out-of class. In higher education it prepares would-be teachers and engineers for an out-of-school, activity-oriented project method (Kováts-Németh, 2010).

Today's teachers have the task of turning their learners into adults who want to do something to protect the environment around them. Describing the present state of the environment is insufficient. Students need to understand the importance of prevention and the fact that every single person has a responsibility for shaping the future state of the environment. That is why it is important to equip them with the most positive environmental attitudes and environmentally conscious behaviours whose development is one of the school's major tasks on all levels of education. Studies on environmental attitudes have become more significant as a major goal of environmental education is to turn students into adults who find the protection of nature and the environment important.

Students' environmental attitudes are influenced by several factors. It is best to start shaping it as early as the nursery school years and it is necessary to address them intensively by developing science knowledge, environmental attitudes and emotional attitudes. In the secondary school attitude-shaping is a more difficult task but is can be made efficient by the appropriate restructuring of gaining knowledge as well the methodological dimensions of learning and teaching (Lükő, 2003; Thiengkamol, 2011).

2. Research aims

One aim of my research was to study secondary school students' environmental attitudes. I chose this age group because at this age environmental attitudes shaped as a result of effects on elementary school children can be well studied. On the other hand, at this age, there is a significant proportion of those disciplines (both content-wise and in a methodological aspect) that provide a wide range of opportunities for the development of environmental attitudes in an integrated form. During our research we focussed on the level of the components of environmental attitudes (science knowledge, emotional attitudes towards the environment and environmentally conscious attitudes) and their relationship with the factors affecting them. Since the components affecting environmental attitudes are rather diverse, we intended to give as comprehensive an overview of their role as possible. Some of the factors we studied were: the environmental education-centered examination of the final examination requirements in science subjects, the level of science knowledge functioning as a basis for environmental attitudes and the effect of the project method. This is a method in environmental education that requires the most independence on learners' part in both learning and teaching concerning environmental attitudes, as well as the role of some in- and out-of-school factors. This study is a diagnosis of how efficient education and schools are today in terms of environmental education, where deficiencies are and how they can be remedied.

3. Research hypotheses

1. Final examination requirements in science subjects do not exploit the contents of environmental education to the full in all cases.

2. Secondary school students' science knowledge is greatly affected by age, gender, and the nature of their knowledge.

3. Among the methods used in environmental education the project method, by its very nature, exerts a positive effect on the development of environmental attitudes as well as on learners' personalities and self-assessment.

4. The environmental attitudes of the students who participated in the study can be considered good.

5. Secondary schools' educational aims and nature as well as the school's general atmosphere affect students' environmental attitudes.

6. In-school and extracurricular activities related to environmental education have a positive effect on learners' environmental attitudes.

7. Secondary school students show concern for the protection of forest wildlife and the natural environment.

8. Students' environmental attitudes are affected by their school performance.

9. Development of environmental attitudes is greatly affected by parents' educational level.

4. Methods used

Literature and document analysis:

During our research we placed great emphasis on the precise definition of basic terms. We deemed it particularly important to provide a description of the terms environmental education, sustainability, and environmental consciousness. We also examined the parts of the National Curriculum (NAT 1995, 2003, 2007, 2012) which has undergone several changes in recent years, which are relevant to environmental education.

During an analysis of the literature we touched upon the Hungarian and international history and importance of environmental education. We collected the guidelines and objectives of environmental education and finally, the documents of its legislation.

The next step was to address the role played by environmental education in education in general. We summarised the possibilities and methods of environmental education in and out-of-class. We gave a more in-depth description of the project method as it was a method that we used in our studies. Based on Hungarian and international literature, we also studied the effect of project work on students' personalities.

Finally, we analysed the results of our earlier environmental attitude studies for mainly secondary school students. Secondary school students' attitudes are determined by various background factors; we also made an attempt at revealing these.

Our *document analysis* covered the examination of the environmental aspects of the requirements for the Ordinary and Advanced level school-leaving exams in biology, chemistry, physics, and geography. We compared the requirements of the final examinations in effect as of December 31, 2016 and those of the new final examinations in effect as of January 1, 2017.

Knowledge performance test: we examined the level of students' knowledge of the environment, which, in our understanding, functions as a basis for their environmental attitudes. We compiled our own knowledge performance test for learners' knowledge of the environment (science knowledge) and asked learners to complete it. It consists of 25 items that tested 11 disciplinary (learnt in one subject only) items and 12 interdisciplinary ones (learnt in several subjects). When compiling the knowledge performance test, we relied on the text books by Mozaik Publishing House. There were two items that tested knowledge that the book we used did not contain material on.

Project teaching: we examined changes in the environmental attitudes of secondary school learners who participated in the large project „Környezetünk a XXI. században" („Our environment in the 21st century") as well as their effect on students' personalities using the project method. The large project was implemented with the participation of 109 grade 10 students in the Diósgyőr High school (Diósgyőri Gimnázium) of Miskolc. 30 of the 109 students participated in the large project while 79 made up the control group. The large project had 10 sub-topics, which were discussed in groups of three. Students had one year to finish the project. As a result of the project we measured changes in the three components of environmental attitudes as well as the complex effect of the project on learners' personalities.

We measured the effect of the project on personality using a questionnaire consisting of 60 statements on self and partner (other) assessment.

Data collection using a questionnaire: The questionnaires containing questions about environmental attitudes and background factors were completed by 1328 students of 4 secondary schools in Miskolc in 2016.

Statistical analysis, calculations: evaluation of the questionnaire on final examination requirement, the knowledge performance test, the environmental attitudes, and background factors was performed using the SPSS 17.0 statistical evaluation software.

5. Research results, conclusions

The system of final examination requirements contains precisely the knowledge that school-leavers need to posses at the end of their secondary school education. Environmental education is not taught as a separate subject in most schools, thus the knowledge related to it is integrated into the system of requirements for science subjects for school-leavers. Due to the peculiarities of the disciplinary contents, the requirements of the four science subjects (biology, physics, chemistry, and geography) contain knowledge about the environment (science knowledge) in different proportions. Our results showed that the system of requirements for final examinations in science subjects introduced in January 2017 does not contain significantly more content in terms of environmental education than the previous system of requirements did. It was also revealed that, out of the four science subjects, only the ordinary-level final examination requirements in biology and chemistry introduced on Jan 1, 2017 contained significantly more content on the environment than the advanced-level school-leaving examination requirement.

Measuring learner performance on the knowledge performance test for science knowledge revealed that learners' performance of disciplinary science knowledge was poor compared with their interdisciplinary knowledge. The reason for this difference is that certain contents occur in several science subjects, approached from different angles, highlighting their interdisciplinary nature. Content that learners have heard, learnt and applied several times leads to more thorough knowledge. In addition, it is not only in class that learners gain new information about their environment but, besides the influence of the Internet and the media, learners are affected by several out-of-school events, which become integrated into their science knowledge. In most of the questions on the questionnaire the best answers were

given by school-leavers (grade 12 students). Environmental education integrated into subjects is more efficient if the most important knowledge features in all science subjects. This requires increased harmonisation of the systems of requirements of science subjects. Examination of the answers given by gender revealed the same results as earlier studies (Vári et al., 2000; Felvégi, 2005; Balázsi et al., 2012), namely that boys performed better.

On the whole, the large project „Környezetünk a XXI. században" had a positive effect on students 'environmental attitudes. At the end of the one-year-long project we found a slight positive shift in students' environmental attitudes. The results confirmed that a more lasting development takes longer. Project activity carried out in classes and in extracurricular modalities is a useful method in environmental education but in and of itself is insufficient to bring about significant changes in students' environmental attitudes. In the case of secondary school students we can achieve real success by using a variety of methods and developing social consciousness.

A separate examination of the components of environmental attitudes showed that students have a high degree of emotional attachment to environmental issues and possess significant science knowledge. In contrast, there is room for improvement in the field of environmentally conscious behaviour. Great emphasis needs to be placed on making students aware of opportunities that enable them to do and want to do something to protect the environment.

In the examined fields the project had a positive effect on students' personality development. One of the objectives of the project was to make students work together as much as possible, leading to steady improvements in their communication and problem-solving skills and co-operation. In addition, they learnt to adapt to one another, listened to group-members' ideas and made decisions together. At the beginning of the project students volunteered to develop their topics based on their own field of interest. The students who participated in the project had never taken part in similar group work, which presented a problem for them. In terms of gender differences, boys did better than girls. Based on self- and other evaluations we concluded that students were realistic in their evaluation of themselves and others, thus the results were correct in this aspect, too.

In Hungarian and international education an increasing amount of attention is being paid to shaping students' proper environmental attitudes. In accordance with previous research (Leeming et al., 1995; Chan, 1996; Varga, 1999; Széplaki, 2004; Liefländer & Bogner, 2014; Leeuw et al., 2015) we concluded that the studied secondary school students had average environmental attitudes.

Examination of the three components of environmental attitudes (behaviour, emotional attitude, and science knowledge) revealed that students in the sample reached the highest average in their science knowledge. However, their emotional approach to environmental issues and their environmentally conscious behaviours lagged behind the level of their science knowledge; it is schools' important task to further improve these components.

A more thorough analysis made the establishment of clusters in the three fields of environmental attitudes possible. We distinguished between students who were more and those who were less conscious in their behaviour. The majority of the students belonged to the less conscious group and were characterised by a lack of commitment to doing something to protect nature and the environment. Within the field of emotional attitude we distinguished a group with less positive emotional attitudes, one with neutral or indifferent, and a third group with a positive emotional attitude. In this field there was a majority of students who had neutral, indifferent attitudes; these are the ones whose attitudes need to be changed in the future. Students' positive emotional attitudes were accompanied by more environmentally conscious behaviours, which led us to conclude that, to increase the proportions of students with more environmentally conscious behaviours, we need to improve students' neutral and less positive attitudes. In classes we need to apply methods that can be used to make students act through their emotions. Continuous expansion of secondary school students' knowledge of the environment is necessary so that they will become more and more efficient in protecting the natural environment around them. Those who possess more science knowledge behave in more environmentally conscious ways and show more positive emotional attitudes.

The type of authorities running schools does not have a significant influence on the development of the examined population's emotional attitudes. It was also confirmed in our study that students of religious secondary schools did not reach significantly better results in environmentally conscious behaviours, emotional attitudes or science knowledge compared with students in state-owned schools.

The school's eco nature did not significantly affect the environmental attitudes of students in the sample. Of the components of students' environmental attitudes it is their environmentally conscious behaviour that is affected positively by the eco nature of the school. The two other fields of attitudes are not significantly affected by the eco nature of the school in our sample. On the whole, the examined secondary school students of an eco school reached better results than those from non-eco schools only in the field of environmental attitudes. To develop proper emotional attitudes and science knowledge more targeted and more pronounced education is necessary in eco schools, too.

As students progressed to higher levels, out of the components of environmental attitudes it was only in students' science knowledge that we were able to confirm that the average of the 12th graders were significantly better than those in the other years.

Analysis of gender differences showed that the girls had better environmental attitudes. In addition, girls were found to be better in all three sub-fields of environmental attitude. Although these results showed a tendency in accordance with previous research, it is important to examine the reason(s) why the boys lagged behind.

The environmental attitudes of the studied secondary school students were not significantly affected by their permanent place of residence. One presumed reason for this is that these days the gap between the living conditions of students living in smaller settlements and cities has significantly narrowed. Students living in smaller settlements are no longer engaged by nature, but, just like their city counterparts, by the digitalised world.

Environmentally conscious behaviour is determined by students' desire to study at institutions of higher education since it is usually secondary school students who want to go to study at university that behave in a more environmentally friendly way. Participation in competitions affects the three components of students' environmental attitudes in varying degrees. Those who have participated in more competitions behave in a more environmentally conscious way, their emotional attitudes are more positive and their science knowledge is more profound in the case of some statements on environmental protection than those who have not participated in competitions them or only in a few. In terms of their academic performance secondary school students who had better academic results showed better averages in all three sub-fields.

In our sample, secondary school students' environmental attitudes were not determined by their parents' educational level. However, better general school atmosphere had a positive effect on the examined secondary school students' environmentally conscious attitudes, emotional attitudes and science knowledge.

Our results led us to conclude that the students in our study did not show due concern for the protection of forest wildlife (feeding birds in winter, or using fewer products made of animal fur); they are indifferent to the shrinking of animal habitats and the worsening state of the environment. Most of the students that we studied completely or partly agree with the statement that people often overuse our natural resources.

6. Evaluation of the hypotheses

Our first hypothesis that „*Final examination requirements in science subjects do not exploit the contents of environmental education to the full in all cases*" **was confirmed** in our study because, of all the requirements of science subjects, it is the system of requirements in geography that contains the most content related to environmental education. Our results showed that none of the science subjects' new final examination requirements contained any more content related to the science of the environment than the earlier one.

The second hypothesis was *„Secondary school students' science knowledge is greatly affected by age, gender, and the nature of their knowledge".* This hypothesis **was confirmed** as our study found that as the students spent more years at school and progressed to higher grades, they gained more and more diverse science knowledge. The studied secondary school students gave significantly more correct answers to the interdisciplinary questions on the questionnaire than on the disciplinary ones. In terms of gender differences, in agreement with previous research, the boys achieved significantly higher averages than the girls (Vári et al., 2000; Csapó, 2002a; Felvégi, 2005; Balázsi et al., 2012). In sum, the students' science knowledge is more thorough when they address a topic in several subjects, approaching it from different points of view.

According to the third hypothesis, „*Among the methods used in environmental education the project method, by its very nature, exerts a positive effect on the development of environmental attitudes as well as on learners' personalities and self-assessment*". The positive effect of project-based learning could be **confirmed only partially** as we did observe some improvement but it was not significant. We used self- and other evaluation to examine the effect of the environment project that we studied on the students' personality. In general we can conclude that the project had a good effect on the sample. Analysis of the self- and other evaluations led us to conclude that the students' evaluations of themselves and one another were realistic.

Next we examined the background factors that determine secondary school students' environmental attitudes. We concluded that the studied students had average environmental attitudes and, out of the three sub-fields of environmental attitude, they showed the best results in science knowledge. At the same time a lot more attention should be paid to the development of students' environmentally conscious behaviour and emotional attitudes. During our research we conducted a cluster analysis of the three sub-fields of environmental

attitude. Based on that, we classified the students in the individual sub-fields into different groups. A large proportion of these students were found to be indifferent to environmental questions but most belonged to the more environmentally conscious group. Positive emotional attitudes were accompanied by more environmentally conscious attitudes. Students with better science knowledge behaved in a more environmentally conscious manner. Thus we **can conclude** that our fourth hypothesis **was confirmed**, too: *„The environmental attitudes of the learners who participated in the study can be considered good"*.

During our studies it was our goal to study the effect of the greatest number of background factors possible on secondary school students' environmental attitudes. The type of authority running the school (religious or state-owned) or the eco nature of the school in and of themselves do not significantly affect the individual fields of the secondary school students' environmental attitudes in our sample. Students attending eco schools showed significantly better results only in environmentally conscious behaviour compared to the results of those of non-eco school students. We were also able to confirm that, as students progressed to upper grades, their knowledge of science improved but their environmentally conscious behaviours or emotional attitudes did not. In terms of gender differences the girls behaved in a more environmentally conscious manner, and showed better emotional attitudes to environmental issues and better science knowledge than the boys. In our study the greatest difference between the two genders was in their averages in environmental attitudes and science knowledge. Our results suggest that there is no significant difference between the environmental attitudes of students living in different settlements. We believe that this is due to children's alienation from nature as today's students are engaged and entertained by the virtual world. An analysis of the school's general atmosphere led us to classify answers into groups: the first was made up by secondary school students who deemed their school's atmosphere more positive while the second contained students who judged their school's atmosphere as more negative. Our results suggest that a good general school atmosphere has a positive effect on students' environmentally conscious behaviour, emotional attitudes, and science knowledge. In a more appropriate school atmosphere it is easier to create proper environmental attitudes, students are more open to new things (saving, selective waste disposal); besides, it can pave the way to a better, tighter relationship between school and parents. In light of the above we can consider our fifth hypothesis **confirmed**: *„Secondary schools' educational aims and type as well as the school's general atmosphere affect students' environmental attitudes*".

The environmentally conscious behaviour of secondary school students who regularly attend extracurricular activities organised by their school, and, on some statements, even their environmental attitudes and science knowledge, is better than that of those who do not attend such activities. These results of ours **confirm** our sixth hypothesis: *„In-school and extracurricular activities related to environmental education have a positive effect on learners' environmental attitudes"*.

To confirm our seventh hypothesis we examined to what extent secondary school students care about forest wildlife around them and how important the protection of the natural environment is to them. The results gained suggest that we need to place greater emphasis on the environmentally conscious behaviours of the secondary school students in our sample because students do not pay sufficient attention to winter bird feeding. A large proportion of the students studied had appropriate knowledge about the environment around them. Thus, we **were unable to confirm** our seventh hypothesis: „*Secondary school students show concern for the protection of forest wildlife and the natural environment*".

Students' desire to go on to higher education, their participation in competitions and their academic average have a positive effect on their environmental attitudes. Our results showed that those who would like to go to university and have participated in several competitions behave in a more environmentally conscious manner and their emotional attitudes are also more positive and their science knowledge is better on certain statements on the environment. These results **support** our eighth hypothesis: „*Students' environmental attitudes are affected by their school performance"*.

We had assumed that parents' level of education had a positive effect on their children's environmental attitudes. However, our sample showed that parents' level of education was not a determining factor in terms of their secondary school children's environmental attitudes. We believe that we would need to study a larger population to prove this assumption of ours. Thus we were **unable to confirm** our ninth hypothesis: *„Development of environmental attitudes is greatly affected by parents' educational level'.*

7. Theses

1. Our results have led us to confirm that there is no significant difference in the environmental education aspect of the final examination requirements in science subjects for ordinary and advanced levels introduced as of January 1st, 2017, compared to previous

final examination requirements. Changes can be observed only in biology and chemistry, where the ordinary-level final examination requirements in biology and chemistry contained significantly more content on the environment compared to the advanced-level final examination requirement.

2. Based on our knowledge performance test we concluded that the students' performance in disciplinary science knowledge was poorer than their multidisciplinary knowledge. In the studied sample the boys had more science knowledge than the girls.
3. Using the one-year-long project did little to change the secondary school students' environmental attitudes. The data gained suggest that, to ensure lasting development, the project method needs to be used over a longer period of time.
4. Analysis of the components of students' environmental attitudes showed that secondary school students' attachment to the environment is good and they possess significant science knowledge. In spite of this, their environmentally conscious attitudes are not satisfactory, and special attention needs to be paid to awareness-raising not only in schools but also in their social environment.
5. The results of our study show that a majority of the students in our sample belong to the group characterised by a less environmentally conscious behaviour. In terms of emotional attitudes, the majority of students were neutral. A large proportion of the students in our sample have better science knowledge. Positive emotional attitudes are accompanied by more environmentally conscious behaviours. Those with more science knowledge have more environmentally conscious behaviours and more positive emotional attitudes.
6. Our results confirmed that the project had a positive effect on the students' personality development. During group work students worked together a great deal, their communicative skills, cooperation and problem-solving improved. They learnt to adapt to others, listen to ideas of the group members, and make decisions together.
7. Our results show that the type of school according to authorities running the school, parents' level of education and permanent place of residence have no significant effect on the development of the environmental attitudes of the studied population. Students studying in religious schools did not achieve any better results compared to students of state-owned school in environmentally conscious behaviour, emotional attitude, and science knowledge.
8. Our results showed that the eco nature of the school, the year and students' desire to study in higher education did not significantly affect our secondary school students' environmental attitudes. Among the sub-fields of environmental attitudes environmentally

conscious behaviour is the field that is positively affected by students' desire to study in higher education as is the eco nature of the school. As students progress to higher years, secondary school students' science knowledge improves.

9. Our measurements confirmed that, while secondary school students' school performance (participation in competitions, academic average) do not affect the three sub-fields of environmental attitudes, participation in events organised by the school and the school's general atmosphere do. Students who have participated in several competitions and had better academic results behaved in a more environmentally conscious manner, their emotional attitudes were more positive and their science knowledge was also better than those of students who did not attend study competitions at all or only a few. It was found, however, that a better general school atmosphere had a positive effect on the studied secondary school students' environmentally conscious behaviours, emotional attitudes, and science knowledge alike.
10. Our results suggest that, in shaping secondary students' environmentally conscious behaviour, we need to focus on drawing our students' attention to protect their natural environment and, within that, forests (winter feeding of birds, using fewer products made from animal fur). To achieve this, we could greatly rely on activities held outdoors and by forest schools.

8. Suggestions

It is necessary to create new materials dealing with the environment in the ordinary as well as advanced level final examination requirements in science subjects. The final examination system of requirements in effect now contains a lot of knowledge that school-leaving students should possess. This knowledge should be linked, as often as possible, to the contents taught in environmental education. Unfortunately, the system of requirements in effect now contains less material linked to the topic of the environment than the previous one did.

A large proportion of teachers tend to use traditional methods in their classes even today. An increasing body of research shows the importance and role of project pedagogy in teaching. More and more opportunities need to be provided for teachers so that they can familiarise themselves with the new methods and can learn to use them in teaching. Teachers'

refreshment courses are excellent opportunities for this, thus more and more methodological refreshment courses need to be introduced in education.

We found that in the studied institutions the eco nature of the school did not affect students' environmental attitudes. In spite of this, it is important to encourage teachers in the institutions to apply for the title "eco school", and increase the number of eco elementary and secondary schools. If schools set a good example, parents' environmental attitudes might change positively, too.

We also find it important to inform teachers on what methods should be used in teaching individual subjects to make the transfer of science knowledge even more effective and thus promote the development of appropriate environmental attitudes.

In education teachers today have to cover teaching material at a forced pace to meet the system of requirements of individual subjects. The teaching material needs to be reduced and, in teaching science subjects, we must make sure that every student should experience work in a forest school at least once. They should not only address topics in classes but they should also experience this mode of gaining knowledge.

Our results support the view that today's students have a great deal of science knowledge but their emotional attitudes and environmentally conscious behaviours lag behind. More activities need to be organised both in class and out-of class that we could use to influence students' environmentally conscious behaviours and emotional attitudes.

9. Publications in the topic of the thesis

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