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**Examining the attitude towards the subjects of natural sciences and
environmental studies among students majoring in teaching**

PhD thesis

Topic leader

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INTRODUCTION

The teaching of natural sciences was considered a successful branch of Hungarian education for many decades, and in a certain sense it is still very effective today (international recognition and successes of engineers and computer scientists). Even in the international natural science studies of the 1970s and 80s, Hungarian students were at the forefront of the world (Csapó, 2000; Nagy, 2007). Even today, our students achieve significant success in international competitions¹ and student' Olympiads, but international success and the everyday practice of education show a very contradictory picture.

Several phenomena show that the greatness of Hungarian science education has been questioned for decades. By researching the causes and looking for explanations, several approaches were created. In her doctoral dissertation, Mária B. Németh (2009) agrees with the explanation that Hungarian students think in classes. They can no longer apply in chemistry classes what they learned previously in physics, they cannot use their knowledge of chemistry in biology classes, and so on. In her opinion, this means that the knowledge conveyed by the subjects creates islands of knowledge that form systems of weak connections with each other. One of the biggest contradictions in Hungarian science teaching – which Csapó (2000) also emphasizes – is that there is a gap between students' theoretical and subject knowledge and its applicability in everyday situations.

Research has confirmed that the attitude of primary and secondary school students towards the subject of natural sciences has changed or is changing in an unfavorable direction as the years progress (Csapó, 2000; 2002; Józsa – Papp – Lencsés, 1996).

According to Hill's (2015) research, a significant number of students entering teacher training have a negative attitude towards science subjects. That is why the four years of teacher training can be crucial for changing previous negative impulses, supplementing and/or deepening certain knowledge, and honing value judgments related to the subject.

Teacher training institutions have a multifaceted task, which includes, in the case of teaching students, the formation of values related to natural sciences and their education for sustainability. Since future teachers will have a serious role in these areas of education, my research prioritizes the development process of the students' attitudes and knowledge, as well as the communication style used in the environmental studies classes they hold during the teaching practices, and the interactions between the teacher candidate and the children.

We must also take into account the phenomenon that the roles of the teacher have changed by the 21st century (Hercz, 2005). During traditional teaching and learning, the teacher primarily fulfills/has fulfilled the role of information mediator. In competence-based development strategies, the role of the teacher as an information mediator is pushed into the background, on the one hand by the change in the concept of knowledge, and on the other by the spread of information carriers. A teacher can be effective and successful if he manages learning by creating a suitable learning environment and emphasizes the development of student abilities in their work (Fűzéné Koszó, 2012).

I have been working in higher education and teacher training since September 2016. Among other things, my task is to teach the natural science methodology course for students majoring in teaching. In teacher training, we find that a significant number of students have insufficient knowledge of natural sciences, and their motivation to learn about nature and natural sciences is low. Therefore, in addition to establishing and building up a well-applicable methodological repertoire, the training also considers the filling of incomplete professional background knowledge to be an important task. The path leading to the development of the latter cannot be successful if students are disinterested and only want to complete the science courses with the minimum expenditure of energy.

¹See: [Huge success in several subjects]: https://eduline.hu/kozoktatas/diakolimpiak_UMP5VD

On the basis of the above, my goal was to gain an in-depth understanding of the main characteristics and development of the relationship between teacher candidates and the subject of environmental studies, as well as the factors influencing this. It was also a serious inspiration for me to try to uncover characteristics in the relationship between the students and the subject of environmental studies that could help the effectiveness of their training. The practical relevance of my research is primarily manifested in the subject pedagogy of science in teacher training and the teaching practice of the subject, in such a way that the results of the research can be incorporated into teacher training methodology courses, and can also provide guidance to the student, the methodology instructor and the mentor pedagogue in relation to the teaching of the subject.

THEORETICAL FOUNDATIONS

This exciting multidisciplinary research area has attracted the attention of many researchers. Numerous domestic and international literature deals with students' natural science attitudes, the literature repertoire is extremely abundant.

The theoretical foundation of my research work is based on 3 pillars, these are the following:

- (1) the historical context (brief history of domestic teacher training; teaching materials of natural science courses in teacher training curricula; history of the subject of environmental studies);
- (2) pedagogical synthesis of attitude research related to natural science subjects;
- (3) pedagogical synthesis of research conducted among teacher candidates;

(1) The historical context was justified by the experiences of the students gained at school, the professional and methodological foundation of the teachers, and the development of the subject of environmental studies. It can be concluded on the basis of known literature (Donáth, 2000, 2008; Hunyady, 1993, 2000, 2004, 2012; Kelemen, 1998, 1999, 2007; Mészáros, 1991, Molnár, 2009, 2014, Németh, 1990, 1993, 2012; Podráczky, 2019) that domestic teacher training is characterized by continuous development and the desire to renew, building upon traditions, the needs of public education, international experiences and social expectations.

The subject of environmental studies has undergone significant changes in the sixty years since its introduction (1963). The transformation was also required by the changing social needs of the times, as well as the competence-based transformation of the public education system (Homoki, 2021). Its primary purpose was determined by social, economic and political changes. Its methodological development has been influenced, especially in the last 20 years, by the results of educational research. This reinforces the phenomenon that the 2012 framework curriculum included mandatory self-examinations, note-taking and project-like topic processing, as a guide.

Until the introduction of the new National Curriculum in 2020, environmental studies was a subject taught in all four grades of the lower school, preparing for higher-level natural sciences, but also including social aspects. In the fifth and sixth grades, natural science was based on this, in which the foundations of natural sciences were laid out in an integrated manner in the two grades. It can also be noted that there was a big jump in the content and quantity of the topics between the environmental studies in the lower school and the natural science subjects studied in the first two years of middle school.

From September 2020, the teaching of the subject of environmental studies will begin in the 3rd grade (1 lesson per week). This decrease in the number of lessons was also accompanied by content changes. The curriculum of environmental education in the 3rd grade has become more practice-oriented, and the acquisition of knowledge in an active, hands-on way, through

activities, has played a greater role than before. It wants to develop more effectively the practical skills in natural sciences, which the students can presumably use in the middle school. The prominent role of the environmental education class and the close connection between thinking skills and scientific thinking are also confirmed by domestic research (Csapó and B. Németh, 1995; Makádi, 2015). The current time frame, which is the lowest in the last 60 years, may impair the possibility of establishing cognitive abilities. Omitting the 6-8-year-old age group and the reduced time frame of the 9-10-year-old period may result in irreparable skill gaps later on (Győri, 2017).

(2) Attitude towards science, similar to the definition of attitude (Atkinson and Hilgard, 2005; Smith et al., 2016), also means a favorable or unfavorable feeling. The natural science attitude as a subject attitude can be interpreted as a general attitude towards the subject and readiness to learn it (Csapó, 2000).

The science attitude of students is influenced by gender, personal characteristics of the individual, parents, teachers, peer groups, school type, scientific interest (Karalar, 2021; Murphy and Beggs, 2003, 2006; Oon and Subramaniam, 2010, 2013; Osborne and et al., 2003; Rukovina et al., 2012). The results of pedagogical research have shown that the emotional domains of attitudes have an impact on cognitive operations (Sheldrake, 2016; Wang and Berlin, 2010), and that teachers have a great responsibility in the development of positive attitudes towards subjects (George, 2003, 2006; Sahin, 2020).

Countless domestic and international researches have sought solutions to the effectiveness of teaching science subjects. Changing the social status of the natural sciences, curriculum modifications, an integrated approach, methodological changes, teacher effects, the image of motivated students, the pursuit of a competence-based approach by educators, an increase in the proportion of methodology classes and exercises in teacher and teacher training programs were all formulated as solutions (Barber and Mourshed, 2007; Chrappán, 2017; Csapó, 2002; Csíkos, 2012; Nahalka, 1999).

The resulting situation represents a particular responsibility and challenge in teacher training, since the natural science attitude of future teachers will have a decisive influence on future generations (Molnár and Papp, 2014).

(3) Many people have already dealt with the research of teacher training, but it seems that the topic is inexhaustible, as the processes are strongly influenced by newer and newer social phenomena and changes in attitudes. In the research, we can find the entry situation of the candidate teacher, the professional development of the candidates, the problem of teacher training, the responsibility of the training places, the renewal of the content of the training places, the strengthening of cooperation between higher education and public education. (Coultas and Lewin, 2002; Falus, 2001, 2004, Hunyady, 2004, 2012; Józsa et al., 2001; Kotschy, 2015, N. Tóth, 2014; Phelps and Benson, 2012).

Natural science is not a popular subject among students entering teacher training courses, most of them have a negative attitude towards the subjects, fewer and fewer choose the field of study of natural science (in my own institution, students applying for the teaching major have not chosen this field of study for years). The tests also showed, however, that as the training progressed, the attitude towards the natural sciences changed in a positive direction. (Bom et al., 2019; Hill, 2015; Lewis, 2019; Palic Sadoglu and Durukan, 2018; Yorkovsky and Levenberg, 2021).

The research also shed light on the difficult situation of teacher training. The decrease in the number of students, the arrival of Generation Z in training, compliance with competencies and standards, and the increasingly popular research-based teacher training are challenges for all institutes.

Presentation of the results of my preliminary research

Below, I describe my pilot research on the topic, which provided a good basis for the preparation of the national measuring instrument. In my first study, I examined the attitudes of full-time students majoring in teaching towards natural science subjects. The second research revealed the attitude of 3rd and 4th year university students to the teaching of the subject of environmental studies. The third study examined the characteristics of students' teaching practice in the subject of environmental studies. We published the results of each study, which resulted in 12 presentations and 3 studies ².

The results of the three pilot studies confirmed that it is worth dealing with the topic. The results can provide guidelines for the development of science methodology and practical courses, and contribute to the renewal efforts of teacher training.

I think it is important that my students are aware of what situations and learning situations they have to create in the given grade and at the given age in order for the mastering of the individual curriculum content and the development of different abilities to really take place. However, I experienced these learning situations less often in student-led teaching-learning processes. There should certainly be more emphasis in methodology courses on students understanding cause-and-effect relationships. By this I mean the exploration and understanding of the connections between the teaching materials belonging to the individual topics of the environmental studies subject, and between the teaching method and its effect. All in all, these phenomena contribute to students planning their lessons more consciously.

My results also highlighted that it would definitely be instructive to carry out the same research in other institutions, in order to reveal whether the test results obtained are unique in our institution or are typical of teacher education in general.

OBJECTIVES, HYPOTHESES AND MAIN QUESTIONS, METHODS, TOOLS OF MY RESEARCH WORK

Objective

Based on my interest in the topic and the literature I have come across, which emphasizes the attitude-shaping effect of the teacher, I thought it important to get to know the attitude of teaching students towards natural sciences and the teaching of environmental studies.

Research questions

I have grouped my research questions around three major issues.

- What characterizes students' natural science attitudes and which factors influenced their development?
 1. What characterizes the students' interest in natural sciences?
 2. What natural science attitude do they come to the training with?
 3. How do students feel about learning the natural science subjects (biology, geography, physics, chemistry) studied in high school?
 4. What do they think about the teachers who teach high school science subjects?
- How do the natural science attitudes of students develop as a result of university science contact classes and school practice, and which factors influence the development of attitudes during training?
 1. How much do they like the science modules in the training?
 2. How does the attitude change during the training?

²See: <https://m2.mtmt.hu/gui2/?type=authors&mode=browse&sel=10056931>

3. Under what factors does it change?
4. How do you feel about teaching the subject of environmental studies?
- How do the students relate to the teaching of the subject of environmental studies?
 1. How can the activities of the students in teaching the subject be characterized (preparation, choice of aids, use of methods, organizational forms)?
 2. How do the students feel about the mentor's activities?
 3. How do they characterize their own competence in relation to teaching environmental knowledge?
 4. To what extent does the popularity of the natural sciences influence the teaching of the subject of environmental studies?
 5. Which areas of teacher competence influence the teaching of the subject of environmental studies?

Hypotheses

The formulated hypotheses were based on the literature, on the one hand, and on the results of my previous investigations, on the other. My hypotheses are consistent with my research questions. My 1st and 2nd hypotheses refer to the factors influencing science attitudes, the secondary school effects. The 3rd, 4th, and 5th seek answers to the connections between the relationship to the subject of environmental studies and teaching. Hypotheses 6 and 7 examine the differences between students in the field of literacy.

- H1: Students who prefer natural science subjects during their high school studies also prefer these courses in university education (there is a continuum between the popularity of natural science subjects in high school and university).
- H2: The primary/secondary school teacher (science) is a positive role model in teaching the subject of environmental studies.
- H3: Regarding preparation for class, there is a difference between the patterns of students who consider the subject important and those who consider it less important.
- H4: Students who consider the subject of environmental studies to be important realize adaptability better when preparing for class.
- H5: Regarding class attendance, there is a difference between the patterns of students who consider the subject important and those who consider it less important.
- H6: There is a relationship between the students' own competencies and their opinion of the mentor.
- H7: The pattern of attitudes towards the subject of environmental studies of students in the fields of natural science and non-natural science shows a difference.

Test methods, tools

The choice of the test method was also influenced by the complexity of the research, the territorial coverage of the sample (national) and the epidemic situation. Among the methods often used in pedagogical research, I used the online questionnaire survey. The measurement took place between November 2020 and February 2021. I included all teacher training institutions in the country in the national research. I contacted the heads of the institutions and the specialists of the teaching profession by e-mail, and the essential information about the research was also provided by e-mail. I received positive feedback from all 13 teacher training institutions (at 20 training locations) for receiving the online questionnaire and sending it to their teaching students.

The self-edited questionnaire contained both open and closed questions, mostly closed-ended ones. I divided the questions of the questionnaire into five large groups;

- Background variables (students' gender, year of birth, institution, grade, field of study, mother's highest education, father's highest education) (8 questions);
- Interest in activities related to natural science topics (parents' education related to natural sciences, hobbies/leisure activities of families related to natural sciences, interest in topics related to natural sciences) (5 questions);
- Attitude towards secondary school science subjects, (type of secondary school, popularity of science subjects in secondary school, attitude towards secondary school science subjects, typical teaching methods, working methods and aids of secondary school science classes) (13 questions),
- Attitude towards the natural science subjects in the students' university education (likeness of courses related to foundation and methodology) (4 questions)
- The teaching of the subject of environmental studies (20 questions).

From their responses to the items, I provided the students with a 5-point Likert-type scale suitable for a more differentiated expression of their "agreement" or "disagreement" in order to make it easier and faster to complete.

My colleagues and I tested the questionnaire on a smaller sample (n=56) during a pre-measurement, and only after the necessary correction were they included in the national sample. I analyzed the data using descriptive statistics (frequency, mean value, standard deviation) and mathematical statistics (Spearman's rank correlation coefficient, Mann-Whitney test), during which my colleague and I used a Microsoft Excel spreadsheet and the JASP program (JASP Team, 2022) for statistical calculations. At the same time I followed its markings. I used the following indicators and notations: frequency (f%), for interval scales: mean (M) and standard deviation (SD), and for ranking scales median (Me), lower and upper quartiles (Q1, Q3). Spearman's rank correlation coefficient (ρ) was used to verify the hypotheses, and the Mann-Whitney test (U) was used to verify the median agreement of the two subsamples.

With the help of the Microsoft Excel program, I created charts and graphs - all of them edited by myself - and in many cases I present the obtained results in percentage form for easier understanding and a more vivid representation.

RESULTS

A total of 203 students were included in the sample. According to the public database of the Office of Education³, 3,297 teacher candidates studied in higher education in the autumn semester of the 2020/2021 academic year, so the number of participants in the sample is 6% of the basic population. Gender distribution of students is n = 174 (85.7%) women, n = 29 (14.3%) men. Based on the distribution by department, n = 134 full-time (N) and n = 68 correspondence (L) students filled out the questionnaire. The average age of the applicants is 27 years. The biggest limitation of my research was the low number of respondents. There are several reasons for this; in recent years (especially during the virus situation), the number of online questionnaires in our lives has increased. Students are overwhelmed. The questionnaire is too long, because it takes them at least 25 minutes to complete it.

The sample is not representative, so my analyses, conclusions and findings can only be applied to the sample. However, my research results can contribute to the content-methodological renewal of teacher education, as well as form the basis of further research.

³Website of the Office of Education: https://dari.oktatas.hu/fir_stat_pub last download: August 3, 2022

Characterization of the sample in terms of interest in activities related to science topics

In this question, I explored the students' interests in natural sciences, their hobbies and activities related to natural sciences. Based on the examination of the educational level of the parents, the phenomenon can be demonstrated that among those who chose teacher training [51.7% (in the case of the mother's education) and 62.5% (in the case of the father's education) of the responding students, the parents (mother's and/or father's) secondary education] is the proportion of families with non-higher education. Typically, first-generation intellectuals come out of the training. I found no correlation worth mentioning between the parents' educational level and the preference for natural sciences ($p > 0.05$), that is, the socio-cultural background of the families (at least in terms of the analyzed data and correlations) is not a determining or influencing factor. The students' families are happy to participate in leisure activities that are related to the natural sciences, but the respondents rarely get involved in the activities. The answers also revealed that students are informed about questions related to natural sciences (90.1%), they like to read notes on healthy lifestyles (58.6% of respondents), environmental protection (72.4% of respondents). 37.4% of respondents are interested in sustainable development. The research did not explore the reasons for the low interest in the topic, but this data can certainly be important information for trainers. Expanding knowledge related to the topic and arousing interest in the field of education is our main task in the training.

Characterization of the sample in terms of attitudes towards high school science subjects

36.9% of the responding students (75 people) graduated from a natural science subject, most of them (85.3%, 64 people) at intermediate level, most of them from biology (28 people), and the least from chemistry (3 people).

The popularity index of science subjects is low (28.9% points), so students did not like science subjects in high school (primarily physics and chemistry). By exploring the reasons for their popularity, I came to the conclusion that the respondents did not like these subjects mainly because they could not learn them or learned them with great difficulty. There can be many reasons for this phenomenon; the methodological poverty of the teacher, the excessive focus on knowledge of the curriculum; the underdevelopment of students' critical thinking, the task-solving-oriented nature of the teaching of the subjects, the lack of consideration of differentiation and prior knowledge, etc. Perhaps the biggest pedagogical problem is that there are subjects in relation to which students have developed negative attitudes. All scales of learning attitude showed low values, this is more typical for chemistry and physics subjects. This value indicates a very low learning motivation (or rather lack of motivation), which obviously has/had an impact on the attitude towards science. The leading motivational factor was getting a good grade when studying the subjects (biology, Me: 4.0; geography, Me: 4.0; physics, Me: 3.0; chemistry, Me: 3.0)

In secondary school, our students typically encountered the usual, traditional educational organization procedures (frequency of lectures and explanations: 82.5%; 68.9%; frequency of face-to-face class work, 74.9%; frequency of using textbooks and workbooks: 83.4%).

Examining the attitude towards natural science subjects in university education

With the investigation, I tried to reveal the attitude of the students towards university science courses. I thought it was important to get to know how they feel about the courses, and whether their attitude towards natural sciences has changed compared to their high school studies. The answers revealed that the students liked the science foundation courses the least, however, as the training time progressed, their attitude changed in a positive direction. The attitude of the

students showed an improving tendency already in the methodology classes, but the teaching of the subject of environmental studies helped them to change their attitude the most. The change in attitude in a positive direction was justified by the personality of the instructors, their interesting presentation style and the useful content of the course they lead. The change in the negative direction was justified by the irrelevantly high content of the curriculum, as well as the personality of the instructors. However, it is worth noting that the assessment of the amount of course content is extremely subjective.

There is a weak, significant rank correlation between the high school subject preference and the university science course preference ($\rho=.299$; $p<0.01$). The results assume some degree of continuity.

One of the important elements of the research was to find out the opinion about the subject of environmental studies. Looking at the frequency distribution of the answers, it can be concluded that the respondents indicated three, four and five values the most. The respondents therefore typically have a positive attitude towards teaching the subject, consider it important, liked it during the practice, and it seems from the results that they will be happy to teach this subject (indicated by $Q1=4.00$ and $Q3=5.00$). In connection with the subject, the emphasis should be placed on the formation of attitudes, the formation of attitudes and the development of skills and abilities in the lower grades. Knowledge transfer is an important tool for achieving the goals listed above. The results showed that the responding students are aware of this extremely important fact and consider their methodological knowledge adequate to achieve the goals prescribed by the curricula. There is a very strong correlation between methodological preparation and teaching environmental knowledge ($\rho=0.894$, $p<0.001$). Obviously, this means that the acquisition of methodological knowledge (both declarative and procedural) can contribute most to the successful teaching of the subject. There is a moderately strong, significant rank correlation between the importance of the subject and the statement about imparting knowledge ($\rho=0.537$, $p<0.001$). This means, in my opinion, that perhaps the most important task of the subject is the transfer of knowledge.

Examining the attitude towards teaching the subject of environmental studies

The fifth part of the questionnaire sought to closely explore the preparation for teaching the subject. Taking into account the distribution of the answering students ($n=203$) by year, and the fact that in most educational institutions this subject is taught for the first time in the 5th semester, I expected that almost half of the respondents (3rd and 4th year students, $n=91$) will be able to give adequate answers about the teaching of the subject of environmental studies. However, only 57 students filled out this part of the questionnaire.

19 of the 57 students taught only one environmental education class during the training until the date of data collection. The low number of respondents ($n=57$) and the fact that one-third of the respondents taught the subject for the first time calls for caution in the interpretation of the results. Among those in the sample, 18 students stated that 1-2 hours is enough for them to prepare for teaching the subject. This time interval can be sufficient if the student already has the appropriate amount of experience, has certain technical and methodological knowledge, and processes the lesson material using simple, challenge-free tasks (both for teacher candidates and children) (Nilssen, 2010). According to the responses of those who completed the questionnaire, their preparation is based on the mentor's guidelines, the difficulties experienced during the preparation were the selection of activities that fit the goals and content (12 people), responding to the teacher's language (5 people), the lack of both natural science and pedagogical knowledge (5 people) caused mostly. The experience of observations during class visits is not taken into account at all in the planning process. The results of the study also show that the students typically prepare for the lessons with the help of environmental studies textbooks and

workbooks, and organize the students' lesson work in frontal class work, which is primarily carried out using traditional, direct control methods. Since the respondents stated that the most difficult thing for them was to reconcile the goal and the content, the aid chosen for the preparation is understandable. The results also revealed that curricula are not considered a tool for planning. Presumably, they will receive the necessary help from the mentor teacher in order to understand the curriculum and learn about the goals and tasks of the topic. During the correlation studies, however, we found no correlation between the preparation time and the aids used during the preparation.

The mentor teacher's assistance is the most typical form of support for beginning teachers. The mentor's dedication to natural sciences provides the student with an example and helps the development of competences in an appropriate way. He copies the lesson presented by the mentor, thereby indicating the reduction of risk factors. Based on the results of my research, it can be established that the activities of the student and the mentor are typically mostly related to class keeping and the analysis of the lessons taught by the student (Me=5.0; Q1=4.00; Q3=5.00). Another important activity is the expansion of the student's methodological knowledge (Me=5.0; Q1=4.00; Q3=5.00). The third is the development of teacher competencies, the deepening of teaching skills (Me=5.0; Q1=4.00; Q3=5.00). It is also important to mention that more than half of the responding students considered that they were greatly influenced by their mentor's passion for teaching and enthusiasm for teaching.

According to the responding students, the most important development task is the transfer of knowledge (Me: 5.0; Q1=4.00; Q2=5.00).

The answers revealed that the students' methodological knowledge (Me=5.0), planning of pedagogical processes (Me=5), communication (Me=5.0), professional cooperation (Me=5.0) and in the area of problem solving (Me=5.0), they improved the most during the teaching of the subject of environmental studies. The results drew attention to the fact that the appropriate professional relationship between the mentor and the student can also contribute to the acquisition of the competencies shown in sustainability education. A moderately strong rank correlation was found between the two variables ($\rho = 0.636$, $p < 0.001$).

Our results also showed (the Mann-Whitney test showed no significant differences in the attitude variables) that the attitude towards the subject of environmental studies is not influenced by the students' field of study.

Results of hypotheses

Hypothesis 1: students who prefer natural science subjects during their high school studies also prefer these courses in university education (There is continuity between the popularity of natural science subjects in high school and university).

I found a weak but significant rank correlation between high school subject preference and university science course preference, so the results assume a certain degree of continuity (biology: $\rho=0.470$; geography: $\rho=0.276$; chemistry: $\rho=0.256$; physics: $\rho =0.196$, $p<0.01$ for each). The assumption was confirmed, which means that students' preference for high school science subjects affects the preference for university science courses.

Hypothesis 2: The elementary/secondary school teacher (science teacher) is a positive model in teaching the subject of environmental studies.

I found a moderate correlation between the attitude towards teaching the subject of environmental studies and the role of the high school science teacher as a role model ($\rho=0.308$, $p<0.05$). There was no correlation between the personality of the elementary school science teacher and the attitude towards teaching the subject of environmental studies ($\rho=0.178$; $p>0.05$). Presumably, the opinions and memories of the primary school teacher are now distant, but at the same

time, the influence of the secondary school teacher is still felt. So my statement was partially confirmed.

Hypothesis 3: Regarding preparation for class, there is a difference between the patterns of students who consider the subject important and those who consider it less important.

In terms of preparation, there is no difference between the two patterns. Those students who consider the subject of environmental studies important do not spend more time and do not use various aids for preparation than those teacher candidates who consider the subject less important. The hypothesis was not confirmed. The value of p for all variables: $p > 0.001$. Obviously, the way to prepare for class is influenced by many factors, including attitudes that influence the sense of duty, responsibility, and thoroughness even in situations that the student does not necessarily consider important, challenging, or even liked. In addition to these, the preparation can also be shaped by expectations, either by meeting the expectations of the mentor or the training institutions.

Hypothesis 4: Students who value the subject of environmental studies realize adaptability better when preparing for class.

Based on the results, it can be concluded that there is no significant difference between students who consider the subject important and students who consider it less important in terms of adaptability. The value of p for all variables: $p > 0.001$. The assumption was not confirmed.

Hypothesis 5: Regarding class attendance, there is a difference between the patterns of students who consider the subject important and those who consider it less important.

I compared the two groups along several variables, such as didactic tasks, teaching methods, and work methods. The test showed no significant difference in terms of the tasks, didactic methods, and organizational methods used in the class, the value of p was in all cases greater than 0.001 (e.g.: practice: $U=282$; $p > 0.001$). The hypothesis was not confirmed.

Hypothesis 6: There is a relationship between the students' own competencies and the opinion of the mentor.

We found strong relationships between the statements. The mentor teacher's personality and professional dedication have an impact on the professional activity of the teacher candidate. The appropriate professional relationship with the mentor also contributes to the student's authentic representation of sustainability and commitment to the natural sciences. ($\rho=0.636$, $p < 0.001$). My statement was confirmed.

Hypothesis 7: The pattern of attitudes of students in the fields of natural science and non-natural science related to the subject of environmental studies shows a difference.

I found that there is no significant difference between students with a natural science background (group 1) and non-natural science background students (group 2) with regard to the attitude towards the subject of environmental studies. The attitude towards teaching the subject of environmental studies is not influenced by the student's field of study. This may stem from the fact that the subject of environmental studies is considered important, but it is also conceivable that it is also due to the way the field of study was chosen.

CONCLUSIONS

The results of my questionnaire research, which I reached based on the opinions about natural sciences of 203 students majoring in primary school teaching, provided me with more useful information related to the training. The attitude of the teacher candidates towards the subject of environmental studies is basically positive. The general assessment of the subject is good, they will gladly teach the subject.

The questionnaire tried to approach the views of the subject from several sides, as a result of which I found areas where the indicators were weaker. These indicators, for example, recognizing the role of the subject in the development of skills and abilities, the effects of the subject

in education. It is necessary to develop related knowledge, views and attitudes regarding the subject, because all of this determines and greatly influences the effectiveness of the educational work. Therefore, in the training of teachers, the role of the subject in the development of students' abilities should be emphasized even more. Of course, this is possible during theoretical and practical education, but the acquired knowledge must be better coordinated with the experience gained in the training school.

I did not see any difference in the views of the attitude towards the teaching of the subject between the students in the field of natural science literacy and the students in the field of non-natural science literacy. In the course of the training, changes in attitude can be achieved among the students regarding the attitude towards the natural sciences, however, due to the cross-sectional nature of the present study, it captures a specific moment and gives a current picture of the situation, so the consideration of the results was limited.

The frequency of traditional, direct management methods and teaching hours organized in frontal class work is not surprising in practice. Of course, it should be taken into account that the teacher candidates shared what they experienced in their first environmental education classes, obviously this type of change will probably change as the student's methodological repertoire expands. The students' results are good and encouraging for the future, and the stated shortcomings can be well developed and learned in practice.

It can also be concluded that in the theoretical and practical training of students, the role of important pedagogical activities such as environmental education, knowledge that can be used in practice, more conscious development of skills and abilities, adaptability, and attention to students should be emphasized more strongly. The fact that the optimal development of different children requires the organization of differentiated (adaptive) education has already been integrated into the Hungarian pedagogical culture, but at the same time, the social, psychological and pedagogical dimensions of education adapted to the students have not become sufficiently conscious elements of the professional culture. I believe that trainers put a lot of emphasis on the strong emphasis on modern methodological approaches (cooperative education, project method, theme weeks, etc.), however, I have found that they appear less in the pedagogical public consciousness and in the everyday practice of schools. At the same time, it should also be noted that Hungarian public education has serious traditions in terms of uniformity, which also means that we are not strong in differentiation, the need for equal treatment was emphasized in practice.

The results related to the appearance of individual lessons and didactic tasks showed that the final part of the environmental education lesson is often shortened due to other factors, and there is no longer enough time for practice, synthesizing new knowledge or even individualized assessment of the students. This result also confirms that differentiation methods should be strengthened in training.

Based on my results and the lessons learned, it can be said that the task of the training places is to train students who are able to face the challenges of their careers, are capable of self-education, and through their methodological preparation, they will be able to prevent the negative attitude change of children in science, or at least to prevent the change at the lowest possible level to keep. For this, the coordinated and cooperative work of the training places and practice places is necessary.

Environmental studies, a popular subject in elementary school, becomes less and less popular in higher grades. In the educational process, the students' knowledge is often determined by their attitude towards the subjects, as the years progress, they lose their interest and learning the subject causes them more and more anxiety. Unfortunately, the level of acceptance of science subjects in Hungary among students is worryingly low. The effect of this can also be felt in teacher training. Students entering the training have a negative attitude towards these subjects.

On the other hand, in order for them to be able to fulfill the set and expected goals of the environmental studies course, we must definitely help the students to change their incorrect professional knowledge, by eliminating possible gaps in their technical knowledge, and by reinforcing the successes achieved in teaching the subject. With these pedagogical opportunities, we can help the students' attitude to the subjects (environmental knowledge, natural sciences) and the teaching of the subject to change in a positive direction. From the results, I can conclude that although the natural science knowledge of the students coming to the training is sometimes incomplete or uncertain, they have the need for development, and if they receive the appropriate motivation, we are also able to shape their outlook. With this information and results in mind, we try to modify and shape the structure and curriculum of our science courses every year. Our goal is also to make students fall in love with science subjects. In my opinion, modernizing the teaching of natural sciences is primarily the task of the teacher, for which the student expects the initial help and impetus from the training. The first step to this is obviously the openness and positive attitude of the teachers of the teacher training courses towards change and change. So basically, a new way of thinking, a new approach is needed.

Another big problem is thinking about the institutional approach to sustainability education. The development of this approach, the systemic change of attitude, can provide an impetus for sustainability education to gain more space in teacher training as well.

The obtained results, according to which the students are taught the subject of environmental studies using traditional methods, organizational methods, and tools, also highlighted some of the shortcomings of teacher training. Based on the results of my research, I agree with what was stated in the study by K. Nagy and Pálfi (2017), according to which teacher training often does not provide sufficient methodological preparation, pedagogical approaches supporting cooperation are still only present to a small extent in teacher training, in training courses and in practice, the traditional role of knowledge-transferring teacher is still preparation is underway. In teacher training institutions, both in graduate and postgraduate education, a lot of space must be devoted to the teaching of cooperative techniques, in order to increase the learning opportunities of all children in primary school, not only for children with learning disabilities and integrated learning. The responsibility of trainers is enormous, including deciding what knowledge material has a place in basic education and what should be implemented in the form of specialized training.

POSSIBILITIES OF PROCEDURE

Taking into account the above results and problems, I would like to continue my investigations among teaching students. Since new questions have arisen during my research results, it is advisable to carry out further investigations in order to form a complete and complex picture. For example, the mentors, methodology instructors, possibly investigations, observations, and interviews revealing the opinions of the children.

My results pointed to the important role of the professional cooperation between the student and the mentor. It would be important to formulate methodological recommendations for the purpose of strengthening mentoring and closer cooperation between mentors and training institutions.

Among my short-term goals are the publication of the results obtained during my investigation and the preparation of a note on natural science methodology.

The ultimate goal of my endeavors is to implement an effective methodology course in accordance with the teaching of environmental studies and the principles of sustainability, which responds to social challenges, with innovative methods, and through the use of online-based tools, contributes to the development of teacher training students' environmental awareness and knowledge of natural science methodology, thereby preparing future teachers for environmental

studies. for the performance of subject and environmental education tasks, the practical application of methods and the handling of global challenges of future generations.

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