ESZTERHÁZY KÁROLY KATOLIKUS EGYETEM

Doctoral School of Education

Environmental Education Programme

ENERGY AWARENESS IN SCHOOLS

- The scope of renewable energy a situation analysis of geography education in Hungary

DOCTORAL (PhD) THESIS

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Objective, hypotheses

All unspent energy serves to protect the Earth and therefore the future of humanity. Meeting the global and local energy needs of our time through alternative means, both industrial and residential, for the sustainable habitability of the planet (EP, 2021; Molnár, 2020; MacKay, 2009) has become a matter of urgency, especially as the pace of climate change accelerates. A prerequisite for the expansion of renewable energy use is that the average citizen should have access to as much information as possible. Environmentally friendly and sustainable technologies will not be sufficiently exploited until they are demanded by individuals' renewable energy-awareness. Achieving widespread social-awareness needs to start at the level of public education, where the capacity of secondary school pupils (as young adults) to act in the near future can trigger decisive changes by mobilising renewable potential.

In my research I sought to find out what the average student in public education knows about renewable energies, which are key to a sustainable future for our

planet, in addition to (or in spite of) the central international and national educational expectations. Furthermore, what the correlation is between the central aspirations under study and the existing knowledge assessed in terms of individual awareness.

The results of my research can shed light on a topical problem that, in the case of the geography subject, can be of clear practical use in the teaching and learning processes - in terms of the "world-saving" role of the practical application of what is known. In addition, this dissertation is also intended to promote the valorisation of geography, a subject currently undeservedly marginalised in national public education.

The findings of the thesis are a coherent, interrelated examination of the elements that reveal the links between central expectations and an individual's actual knowledge. Furthermore, the study can serve as a basis for (educational) developments that could ultimately lead to a more effective - even more useful local, decentralised - implementation of clean energy.

In the light of the research objectives, a fundamental question is: what is the content of the central educational (outcome) requirements for geography in public education in relation to renewable energies?

Hypothesis 1: Since the cumulative increase of meeting energy needs through alternative means is also in the interest of the nation state, the education of citizens in renewable energies at the public school level requires the emphasis of the topic in the national central educational and training regulations, especially with regard to the subject of geography.

The focus is on the subject of geography, therefore an important question is whether it is by its very nature really suitable or able to contribute to the development of an individual's renewable energy awareness.

Hypothesis 2: Geography, as a science subject in public education, is a suitable subject for teaching renewable energy knowledge by its nature and its themes, and for creating a constructive attitude towards renewable energy.

Textbooks are the main teaching tool in geography education, thus, it was necessary to examine what their content is.

Hypothesis 3: Geography textbooks used in public education should include renewable energy knowledge related to energy awareness in the classroom in a way that it tends to be reflected in the curricula that can be related to the subject.

Is it relevant what students actually know and what attitudes they have towards renewable energy?

Hypothesis 4: Students in general education (especially through geography) are aware of renewable energies and thus have an energy-conscious attitude that makes them committed to renewable energies in terms of knowledge, emotions and action.

Material and methods

As an initial step, it was necessary to review the social aspects of international and national energy strategies related to renewable energy targets. In addition, it was

necessary to clarify what is meant by an energy-conscious attitude.

For the first hypothesis, I subjected the *central guiding documents of geography education in the public domain*, the National Core Curriculum (NAT-2012 and NAT-2020) and the related new framework curricula, as well as the National Environmental Education Strategy of national importance, to content analysis by keyword search. The keywords are all related to energy and in particular to renewable energy - for example, the words *"renewable energy"*, *"solar energy"*, *"energy dependence"* or *"heating"*.

Subsequently, in the second hypothesis, I hypothesized that geography is a suitable subject for the development of energy awareness. *The suitability of geography as a subject* for renewable energy was investigated. I have set up a multidimensional systematic line of analysis and characterisation, through which the subject has been presented. These grouping principles included, for example, educational and teaching objectives, content, nature, teaching methods and interdisciplinarity.

In my third hypothesis, I argue that renewable energy knowledge tends to appear in geography textbooks. To this end, I conducted a content analysis of renewable energy knowledge in *6 geography textbooks* and 2 Green Earth textbooks based on NAT-2020 through keyword and empirical search. For comparison, it was also necessary to briefly review the results of the research on the three previous generations of textbooks.

The fourth hypothesis claims that students in public education are aware of renewable energies and have a committed attitude towards them. In the sample of 11 municipalities in Heves County, I measured the *energy awareness of pupils* in the 7^{th} (N=501/ 259 pupils) and 11^{th} (N=501/ 242 pupils) grades. As a measuring instrument I used a questionnaire consisting of 22 questions from a previous OTKA project, in which I participated in the compilation and the questionnaire's design. For the analysis, the questions were typed in terms of energy-conscious attitudes.

Results

The central documents of public education are dominated by knowledge content, therefore teachers need to include other planning documents in the development of energy awareness and the teaching of renewable energies, which address the topic in a professionally sound and approachable manner - the National Environmental Education Strategy is appropriate for this, both in terms of its content and its professional credibility. Of the mandatory documents, the 2020 framework curricula have made the most progress in the area of energy awareness. NAT-2020 has taken a big step forward in shaping energy-aware attitudes.

Thesis 1: The central documents regulating public education - the renewed framework curricula of the National Curriculum, which provide for less geography subjects in grades 7-8 of primary school and grades 9-10 of secondary school, contain an increased proportion of renewable energy-related requirements on the knowledge and skills that pupils should have, following the developments. In this way, these

documents have the potential to create a class of citizens with the energy-conscious attitudes and behaviours set out in EU and national energy strategies.

I analysed the geography subject according to 11 criteria and along the lines of 21st century skills and content units. In exploring the nature of the subject, it became clear that it is highly suitable for developing the energy- conscious attitude of students, both in terms of EU and national energy strategies and the new NAT-2020.

Thesis 2: As a science subject, geography is highly suitable for the development of energy-conscious attitudes via the teaching of renewable energy through the complexity of its natural-socio- environmental and economic themes, its applied nature and its phenomenon-based teaching methods.

Moving from the oldest textbooks to the newest ones it can be observed that there has been significant improvement in the proportions of energy awareness and renewable energy knowledge. In addition to the fact that the

proportion of renewable energy knowledge has increased significantly in the core texts of the knowledge materials, the concepts are also appropriate. In fact, misconceptions have occurred in the previous generation of textbooks. The 2 Green Earth textbooks on sustainability cover energy awareness in a wide range of areas, including healthy lifestyles, environmental management, homes and industry, transport, urban development, local decision-making, consumption patterns and many other aspects.

Thesis 3: In the light of a three-generation geography textbook study, the evolution of the NAT-2020 textbooks in the presentation of knowledge related to renewable energy and energy awareness is significant, but less trendy, and more specific to one or two lessons. Students in year 7 of upper primary school and year 11 of upper secondary school have almost the same opinion on energy awareness. The survey of students' energy awareness attitudes showed that geography is a major source of information on students' renewable energy knowledge, which supports my hypotheses. Overall, the 501 respondents show a medium level of receptivity to environmental issues arising from energy use, which

should be further sensitised by a deeper exploration of cause and effect relationships to promote individual agency - for example, through more energy-conscious consumer behaviour.

Thesis 4: Geography is one of the science subjects within public education that contributes significantly to students' knowledge of renewable energy, with the vast majority of them being familiar with the different types of renewable energy. At the same time, pupils have a positive emotional and empowerment attitude towards the phenomena related to the subject, whereby their energy awareness makes them committed to conservation, environmental protection and modern energy supply for their homes.

Practical applicability and future directions for development

By now, it is easy to see that it is not enough to know that renewable energy exists, but that our choices must be decentralised - less dependent - to realise the potential of local potential in a community way. Renewable energy

sources and their exploitation also provide an opportunity to learn about and develop them. Imagine a student learning about renewable energies today, and then a few years later, as an adult, they can use them or invent and design new, currently unknown, environmentally friendly ways of supplying energy, from which we can all benefit in a sustainable way.

One of my main objectives was to make my results useful in practice for the profession, education and other research and development. This has been successfully demonstrated in the course of this study, but especially by the wide range of future research and development opportunities. Therefore, I have formulated seven aspects for development and eight possible research directions. The two most important of these are mentioned here. In general, increasing the number of geography courses is a justified development, also in view of the conclusions drawn from the correlations identified in the dissertation. On the other hand, in addition to public education, it is worth looking at the central expectations for geography teacher training, as future teachers could be the primary generators of energy awareness.

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