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Raising awareness of anthropogenic
climate change among children
aged 9-10 years

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PhD Thesis Summary

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Objective, hypotheses

One of the biggest challenges facing humanity today is climate change and its consequences. The rise in global temperatures is the primary consequence of the increasing carbon dioxide emissions with apparent signs. (Mika, 2019) Even a seemingly small increase of a few degrees has very serious consequences, which are already being felt today. If we look only at the domestic consequences, there are many results that show that it is definitely worth looking at the phenomenon as a problem. (Bartholy et. al, 2008) We need to know which changes we absolutely have to adapt to, but it is also important to focus attention on the feasible individual steps that need to be taken in order to mitigate the temperature rise.

Humanity's response does not seem to be commensurate with the growing evidence of climate change. One of the reasons why a significant proportion of humanity is still climate-insensitive or climate-skeptic may be that people are often receiving contradictory information on the subject.

It is therefore crucial to minimize the number of people in the younger generation who openly deny climate change and its human origin, which is why we need to introduce environmental education at an early age. This is happening in most cases, but climate education is not nearly as influential as it should be. (Kárász, 2015) It is important that the younger generation is aware of the causes and consequences of climate change, and of what individuals can do to mitigate climate change.

The aim of this thesis is to explore effective ways of raising awareness of anthropogenic climate change among primary school children and to show what other influences are they affected by on the subject.

It is crucial to understand the general knowledge and attitudes of adult society towards climate change for several reasons. Despite our focus on young schoolchildren in particular, analyzing this subject is justified by the fact that children's knowledge and attitudes are also influenced by the adults with whom they live. I

formulated the first hypothesis based on my experiences from everyday conversations and social media.

Hypothesis 1: A large part of adult society is climate insensitive, meaning even if they are aware of the problem, they are not aware of its details and their attitudes are not climate friendly.

It is also important what information people receive in their everyday lives on which they base their climate attitude. My second hypothesis is also based on my own preliminary experience.

Hypothesis 2. In the Hungarian media channels I studied, the causes and consequences of climate change are rarely mentioned. At the same time, there is a lot of misleading and false information. It is also rare to find decisive statements of what we can expect from decision-makers and what opportunities and responsibilities individuals have to mitigate the pace and impacts of the change.

Another important question is the extent to which climate change is reflected in national education policy documents, curricula and textbooks.

Hypothesis 3. In national education policy documents, climate change related content is less present than desired, especially at the primary phase (Year 1-4).

In order to raise the awareness of young schoolchildren on this topic there is a need for activities that focus on climate change.

Hypothesis 4: A well-developed curriculum or afternoon activity can significantly increase the understanding of school children in primary phase about climate change and contribute towards the development of a climate-aware attitude.

Data and methods

The *first hypothesis*, that neither the knowledge nor the attitude of the society's participants is satisfactory, was confirmed by a questionnaire. The questionnaire, consisting of 27 questions, had two objectives. One was to

find out how aware respondents are of the causes and consequences of climate change and the other was to find out if respondents live a climate-friendly life.

In the *second hypothesis*, I assumed that there is insufficient knowledge about climate change through the domestic media because the programs broadcasted there do not contain sufficient information which I verified through a content analysis. For the content analysis, I set up a set of criteria to assess the message of the information source. (Krippendorff, 1996, Szabolcs, 2004)

In Hungary the most watched television channels are the two major commercial channels, namely: RTL Klub and TV2 (brandtrend.hu/nezettseg). The public service channels also have a narrow but stable target group, so I looked at the frequency and quality of climate change coverage on these media outlets too. Internet content is less controlled and therefore more likely to be misrepresented. This content is available at any time, so the videos examined were mainly those that were adequately viewed.

In the *third hypothesis*, it was hypothesized that national education policy documents do not contain sufficient information on climate change. To prove this, I conducted a document analysis by reviewing the latest edition of the National Core Curriculum (NCC), the curriculum framework, and the textbooks for Science studies in primary phases. Once the hypothesis was confirmed, I also sought the opinion of teachers in the form of a short questionnaire.

The *fourth hypothesis* was that a well-developed curriculum and afternoon activities could significantly increase the understanding of primary phase school children about climate change which would contribute to the development of a climate-aware attitude. This was verified by two self-controlled pedagogical experiments. I conducted a knowledge assessment before and after both sessions using a test which I repeated six months after the previous sessions. This showed how effective the sessions were, because I measured not only the short-term but also the long-term effects.

Results

The questionnaire to test the *first hypothesis* was completed by 1197 people. Although the demographic data suggest that, despite the high number of respondents, it cannot be considered representative because the intellectuals are slightly over-represented, yet the aforementioned number is still significant. The greenhouse effect is still seen by many as a negative. In other words, we could say that many people see the greenhouse effect itself as the cause of climate change, when it is only its increase that is the problem, not its existence. There is also a lack of consensus on carbon dioxide. But this indecisiveness is reflected in many of the questions, as I used a 5-point Likert scale for most of the questions, where a medium response indicates that the respondent does not take a position on the question, and many questions had a high proportion of such responses. There is also a lot of misunderstanding about the consequences. Often the phenomenon is confused with an environmental problem; for example, the ozone hole phenomenon is still widely thought to be one of the causes of climate change.

In terms of lifestyle, whether we look at shopping, consumption or transport habits, the majority of respondents do not live a climate-friendly life, although it is clear from the responses that they would consider it important. Thus, first thesis is as follows: **Only a small part of society can be considered climate-denier, but a large part is climate-insensitive, and for most people the attitude - action part is not climate-friendly, based on the lack of knowledge they have about climate change.**

Since previous research and my attitude survey have shown that the adult population is mostly informed by the media, I thought it was important to investigate what content is reaching the population through the media. The content analysis showed that the central theme appears on average every 12 days, with consequences being the most prominent and that the responsibilities of the leadership is featured in every second program. The importance of individual responsibility and adaptation, which would be very important, were in one in three of the contents. Internet videos deal more often with several aspects but less than half of the programs mention individual

responsibility and a serious problem, 40% of the most watched internet content shows misleading content.

Thus, the second thesis as follows: **The amount and quality of climate change related content in the Hungarian-language media is insufficient. Programs that can be considered good quality and give sufficient weight to the causes and consequences of climate change, individual responsibility and adaptation have low viewership. The programs, that are constantly available on the internet, contain too much climate-denialist content, which may mislead the uninformed but interested public.**

My *third hypothesis* focused on the content of the national education policy documents. The NCC 2020 mentions environmental protection only once, but climate awareness is not mentioned at all. Climate change is not even mentioned in the curriculum frameworks. The 3rd grade Science textbook mentions energy saving and selective waste collection and there is a mind map on global warming, but the amount of these is insufficient. The 4th grade Science curriculum does not address the problem. Only a quarter of the teachers surveyed teach in

lower secondary schools but despite this 90% believe that climate education should start at this age. Most do not consider their own knowledge or the content of textbooks to be satisfactory.

Thus, the third hypothesis is as follows: **The National Core Curriculum and the curriculum framework for the primary phase does not place much emphasis on environmental protection in general and climate change as a problem is not present in the curriculum for this age group, despite the fact that the relevant literature confirms that this attitude should be developed as soon as possible and the teachers interviewed agree with this.**

The *fourth hypothesis* was about a curriculum that could be put into practice. Two lessons were developed to raise awareness of climate change, aimed at teaching students about the causes and consequences of climate change and what they can do personally to reduce its impact. Before the lessons the children completed a knowledge assessment test and two days after the lessons the same test was used as a follow-up to see how much their knowledge had changed after the lessons. The same test was repeated

six months later to see how much the knowledge had been retained.

Looking at the results of the tests it can be discerned that there was a significant improvement after the session. I have highlighted the questions relating to individual responsibility and in these questions the improvement was more over 30% which is remarkable as it was achieved in two lessons. The follow-up measurement, performed six months later, showed a slight decrease, but still a significant improvement.

If we compare the Grade Point Average (GPA) of the children involved with the results of the tests we can say that this session has not only increased the knowledge of the good students.

	Avg. of all responses	Personal responsibility	Correlation (GPA – test)	Importance of climate protection (opinion)
Input measurement	56%	54%	0.42	4.06
Output measurement	81%	85%	0.34	4.31
Difference	25%	31%	-0.08	0.25
Subsequent measurement	74%	78%	0.46	4.34

Finally, it is noteworthy that children scored high on the five-point scale when asked how important it is to them to protect the climate but this also improved after the session and continued to improve at the six-month follow-up.

To raise awareness, an afternoon program has also been developed for 9-10 year olds but which can be implemented in any school as part of an afternoon session.

Participants can learn about the causes and consequences of climate change and how to live a climate-conscious life in a playful way. The program was tested in three Hungarian schools with a total of 238 students. Just as previously, before and after the session the children completed a test which was repeated six months later showing that the session had achieved a significant improvement. Again, I have highlighted the questions on individual responsibility and the improvement in these questions was 25% which is also remarkable because this was achieved in one afternoon session. The six-month follow-up measurement showed no decline regarding this question.

If we compare the GPA of the participating children with the results of the tests we can say that this session did not only increase the knowledge of the good students but that there is no significant relationship between GPA and the test results.

Finally, what is also noteworthy here is that the children innately scored high on the question of how important it is to them to protect the climate, yet the results show further

improvement in this regard, which was further improved at the six-month follow-up.

	Avg. of all responses	Personal responsibility	Correlation (GPA – test)	Importance of climate protection (opinion)
Input measurement	57%	59%	0.28	3.5
Output measurement	74%	84%	0.31	4.4
Difference	17%	25%	0.03	0.9
Subsequent measurement	71%	87%	0.03	4.5

Thus the fourth thesis is follows: **Just two lessons are enough to make a significant difference to children's knowledge which is the basis for the right attitude. Lessons are not only an opportunity to increase**

scientific knowledge but also to develop reading comprehension associative and mathematical skills. The afternoon session also showed that this can be done in a playful context with similar effectiveness, although it is probably most effective when both are present in schools.

Practical applicability

All of the results have practical usage but the two school lessons and the day care program are the most notable products. Both have shown that children of this age are receptive enough to the subject if it is communicated to them in the right way and both are feasible in practice and no subject teacher is needed. It turns out that even a concept as complex as the greenhouse effect can be understood if it can be presented to children in the right visual form. One of the results of the pedagogical experiment was that the lessons were based on literary, mathematical and associative skills so that environmental education can also be used to develop other competences. This phenomenon can also work in reverse. It would be worth thinking about curriculum development in a

direction where there would be even more cross-curricular interaction especially with regard to environmental education which could be part of most subjects in this sense. This approach could be implemented not only in the primary phase but also in higher grades so that attention could be kept up. The day care program requires only some organization, no special equipment is needed but the impact, as the measurements show, is truly significant.

The media analysis and the adult society attitudes survey show that the flow of information is continuous, but with poor quality. This phenomenon is certainly noteworthy, and the educational and meteorological professions should therefore join forces to place greater emphasis on the dissemination of scientific knowledge.

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