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Rogers Foundation for Person-Centred Education

GEDANIA 1922

UNIVERSITY OF JYVÄSKYLÄ
FINNISH INSTITUTE FOR EDUCATIONAL RESEARCH

Bridging Humanities and Science Education:

The SCISSORS Project

E-Book

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Bridging Humanities and Science Education: The SCISSORS Project

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1.
INTRODUCTION

1. INTRODUCTION

As a reader, interested in education, you know that science education is more than just teaching scientific concepts and theories. It is about nurturing the students' curiosity, motivation, and critical thinking skills. However, have you ever considered the connection between science and social competencies? This is where our innovative approach comes in.

The purpose of this ebook is to lay the pedagogical foundation for an educational framework combining the sciences and the humanities, and achieve impact through collaborative research and educational activities. Designed for educators, principals of educational institutions and decision-makers seeking to implement a novel pedagogical program, this resource presents valuable materials. Through exploring research-based insights and good practices from Hungary, and Finland, the primary goal is to influence the perspective of teachers regarding the instruction of sciences combined with humanities. This ebook advocates for a paradigm shift where soft skills and critical, analytical thinking are not seen in contrast but as interdependent, fostering a symbiotic relationship for a more impactful and holistic education.

Our educational framework offers a pathway for integrating the development of social competencies into the existing structures of diverse school systems, eliminating the necessity for additional staff. Implementing our approach is a preventative measure against burnout for science teachers and other educators and fosters creativity and self-reflection throughout the teaching and learning journey. This method empowers teachers to link natural scientific discoveries with social occurrences, rendering them tangible and comprehensible for students.

A. Science and Social Studies Rethought in Schools: The SCISSORS Project

The Science and Social Studies Rethought in Schools (SCISSORS) Erasmus+ project aims to bridge science education and the development of social competencies. By incorporating social competencies into science teaching, we can help students discover their world through scientific metaphors. At the same time, focusing on soft skills and social competencies can establish a reflective connection with each other and ourselves that aids curiosity and motivation to understand scientific concepts.

We propose that there is a mutually fruitful analogy between social competencies and topics in science. By dealing with them together, they can support one another: on the one hand, scientific topics can act as metaphors that help us discover our personal world. On the other hand, focusing on our soft skills and social competencies can establish a reflective connection with each other and ourselves, that can aid curiosity and motivation to understand scientific concepts, theories, and models.

We develop an innovative approach, which incorporates these two aspects. Not only does it help students find motivation to understand science while they discover their own competencies in the process, but it also contributes to new, creative ways to teach science. This approach provides a channel through which the development of social competencies can be included in already existing curricula of various school systems.

The SCISSORS project's objectives:

- To develop a mindset where knowledge is interdisciplinary, where the division between sciences and humanities dissolves through creativity and critical thinking, observation and intuition, experiments and experience, analysis and feelings, interactions, and reflections.
- To establish the pedagogical background of a new type of curriculum through a collaborative research process.
- To shape the attitude of teachers towards the teaching of sciences and other subjects, where soft skills and critical, analytical thinking are not contrasted but exist in symbiosis.
- To design and develop a toolbox that helps educators incorporate our proposed approach, and train the teachers to use it, also developing the toolbox further by piloting.
- To address students directly through a methodology that uses folk tales as a means to understand ourselves (and our environment) better.
- To host workshops that allow the spreading of the new approach and can enhance future development in our educational systems.

2.

PARTNERS' EXPERIENCES

2. PARTNERS' EXPERIENCES

A. Rogers Foundation for Person-Centred Education

Focusing on person-centred education since the foundation of Rogers Secondary School in 2005, the predecessor of Rogers Academy, teachers have been engaging in connecting to students and guiding them through adolescence until their final exam (GCSE equivalent with General Certificate of Secondary Education). In this journey, incorporating sciences have often shown to be more challenging than other disciplines of knowledge, that is why we find the program we present here in SCISSORS so important.

This project has given us the possibility to study more extensively already existing good practices (both national and international), focus group discussions with teachers, trainers, researchers, school directors provided us a deeper insight into difficulties, the causes of obstacles but also a platform to ponder upon possible solutions and directions together.

Similarly, working with JYU and Gedania have been very valuable. The sharing of experiences, different approaches have opened new tracks in our thinking and have set off to find their ways in our everyday teaching practice.

Ágnes Valovics and Katalin Csizmazia

Rogers Foundation for Person-Centred Education

B. Gedania 1922 Association, Poland

"We are innovators working on developing a new model of education in Gedania 1922 Association, combining social-emotional development, sport and science on a daily basis at our kindergarten and alternative school, creoGedania. Throughout our participation in the SCISSORS project we have gained a new perspective on folk tales' potential in raising self awareness as well as an interdisciplinary vision on combining science and humanities. Among many of our teams' activities and during focus group discussion we shared a vision on an essential need for change in the Polish Educational system, especially at public schools'. We believe that there is an empty space in science teacher's education that needs to be filled as far as interdisciplinary tools are concerned, used on a daily basis to focus on the well-being of and combining science with humanities."

Agata Hofman and Karolina Melańczuk

C. University of Jyväskylä

The University of Jyväskylä strives to maintain its pioneering position in the field of teaching and learning as Finland's first teacher training university. As researchers from various fields, we believe it is critical to participate in transformative international collaborations such as SCISSORS. Combining science and humanities education is at the heart of SCISSORS, the pedagogical and practical means explained in this e-book.

Collaboration with our esteemed partners, each of whom contributed unique insights and experiences, has been one of the most enriching aspects of this journey. We thoroughly examined curricula, teacher training methodologies, and best practices in science and humanities education. Conducting the literature review across partner country contexts in different languages has been valuable collaborative learning that truly supported our joint actions. This process was intriguing and profoundly rewarding, revealing a wide range of intersecting challenges and inspiring new solutions.

We are delighted to share our knowledge and experience via this carefully compiled e-book. We hope you find it informative but also useful and applicable as you explore the fascinating world of SCISSORS. Whether you want to understand the 'why' or the 'how' of SCISSORS implementation, this ebook is an invaluable resource of expertise and practical insights to guide your educational journey.

Orsolya Tuba, Kristof Fenyvesi, Takumi Yada,
Matias Mäki-Kuutti, Jukka Sinnemäki

UNIVERSITY OF JYVÄSKYLÄ
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3.

WHY DO WE NEED SCISSORS?

WHY DO WE NEED SCISSORS?

Natural sciences already have a well-established methodology for observing, researching, classifying, experimenting, analysing, and drawing conclusions. Children learn these techniques and can apply them in any field. Incorporating social competencies into science education makes it possible that students can find the motivation to understand science while discovering their competencies, and it contributes to new, creative ways to teach science.

Connecting scientific knowledge with self-knowledge can be a powerful way to gain insights about ourselves and our world. Below, we discuss this concept through some practical examples.

Example 1

Firstly, let's consider the universal gas law from physics. This law states that increasing the pressure of a given amount of ideal gas also increases its temperature (and vice versa). Interestingly, humans respond to pressure similarly. When we find ourselves under pressure, we start sweating. This physiological response to stress is one way our bodies adapt to changing environmental conditions. By understanding the universal gas law, we can gain insights into how our bodies respond to stress and learn to manage our stress levels more effectively.

Example 2

Another example is the phenomenon of biofeedback. This technique involves real-time monitoring of biological signals, such as an electrocardiogram (ECG), to gain insights into our physiological processes. Observing our pulse rate and other signals, we can learn to control these processes and even reduce stress levels. This connection between scientific knowledge and self-knowledge enables us to take control of our health and well-being.

Example 3

In ecology, narrow niches refer to species that can tolerate only a narrow range of environmental conditions. Some species are excellent indicators of particular environmental conditions. For example, lichens are extremely sensitive to air pollution, so their presence in a habitat can indicate good air quality. In a classroom, we can also find factors that each student has a narrow limit to, such as noise level, temperature, and density of other people. Recognizing these individual sensitivities can tailor the learning environment to suit each student's needs better. This connection between scientific knowledge and self-knowledge can improve students' learning outcomes and help them understand themselves better.

In the forthcoming sections, we present the pedagogical framework and current understanding in science education, along with an exploration of the needs expressed by the SCISSORS project's educational stakeholders. This examination is grounded in international research findings, specifically focusing on studies conducted within the project's partner countries: Hungary, Poland, and Finland. By using the tools and training we provide, teachers can help students see how different subjects relate to each other and make those connections stronger.

A. Teachers' needs

Teachers are expected to provide students with a comprehensive education that prepares them for the "real world", outside the classroom. However current educational systems often ***compartmentalises*** subjects, creating a disconnect between what we learn and how we apply it in our lives.

At the SCISSORS project's core lies the fundamental idea of cultivating a reflective connection with oneself, fostering curiosity, and enhancing motivation to comprehend scientific concepts, theories, and models. This innovative approach is designed to support science teaching and by nurturing the personal and professional growth of both students and educators. Through implementing our curriculum, teachers can assume the role of burnout prevention tools, benefiting themselves and extending support to their fellow educators. This emphasis on addressing the needs of teachers underscores our commitment to creating a holistic and sustainable educational experience.

In science education, Farnady-Landerl's neuro-scientific investigation (Farnady-Landerl, 2018) in Hungary into attunement's role in learning processes underscores the significance of human interactions in shaping student performance. This exploration into the neurological aspects provides a foundational understanding for educators seeking to optimise the learning environment.

Nagy's exploration of Inquiry-Based Learning (IBL) in science teaching adds another layer to the narrative (Nagy, 2010). As scrutinised by Beke (2016), project-based learning emerges as a compelling solution to waning interest in science studies among young people. The collaborative nature of projects not only renders science subjects more accessible but also fosters a positive attitude among students. Beke's findings highlight the potential of such endeavours to bridge the gap between traditional teaching methods and the evolving needs of contemporary learners.

Through neuro-scientific insights, project-based learning, an understanding of erudition, and the potential of IBL, educators can be equipped with a comprehensive pedagogical toolkit (Farnady-Landerl, 2018; Beke, 2016; Csapó, 2002; Csapó, 1998; Nagy, 2010). These possibilities collectively signify a proactive response to the evolving landscape of education, ensuring that students excel academically and develop a profound understanding of the interconnectedness of knowledge and its real-world applications.

B. Students' needs

Students around the globe suffer from a lack of internal motivation and a lack of coherent implications of subject's content memorised at school and the subjects' relation to future jobs. As a result, their well-being deteriorates. There is a need for action to implement interdisciplinary projects combined with special attention placed on students' self-awareness and soft skills. SCISSORS aims at the - empathy, cooperation, balance, and resilience - that relate to the future job market and increase students' internal motivation by combining science and humanities.

According to the World Health Organization (WHO), depression is projected to be the leading cause of disease burden globally by 2030 (Malhi & Mann, 2018). Based on WHO's projections, by the year 2030, depression is expected to surpass other diseases and disorders in terms of its impact on individuals and society. This prediction highlights the urgent need for effective, sustainable strategies and intersection interventions to address the rising prevalence of depression and its associated long-term consequences on mental health and well-being. Therefore SCISSORS is one of many possible answers to implement science and humanities in an attractive form for young people to raise their self-awareness and base learning more on internal motivation.

ICsapó grapples with the paradox of Hungarian students excelling internationally while facing challenges in everyday achievements (Csapó, 1998). This cognitive psychology-informed analysis questions the alignment between educational goals and societal expectations. It prompts a critical reflection on the effectiveness of teaching methods, urging educators to ensure that students not only excel in educational competitions but also apply their knowledge meaningfully in real-world scenarios.

By connecting scientific knowledge with self-knowledge, students can learn to manage their stress levels, control their physiological processes, and tailor the learning environments to suit their needs better. These connections can lead to improved health, well-being, and learning outcomes. SCISSORS project's innovative approach emphasises the importance of interdisciplinary thinking, where soft skills and critical thinking are not in contrast but symbiosis. By developing a curriculum that incorporates these two aspects, we can help students find the motivation to understand science while they discover their competencies in the process. In addition, this curriculum provides a channel through which the development of social competencies can be included in existing curricula of various school systems without having to make substantial sacrifices on the curriculum currently in use.

C. Society's needs

The envisioned departure from traditional, subject-oriented teaching towards a focus on social competencies responds to a broader societal need. Emphasising collaboration and openness, this approach aims to cultivate individuals who are self-aware and socially conscious, contributing actively to their environment and community.

In education, the conventional divide between sciences and humanities often deters students from pursuing careers in these fields. The proposed shift seeks to make these paths more accessible, addressing the societal demand for diverse skill sets. Additionally, attracting professionals from various fields into schools, such as biologists, researchers, environmental activists, and artists, is a step towards mitigating the ongoing teacher shortage, fostering interdisciplinary collaboration, and promoting innovation. Positive experiences stemming from this educational approach could potentially drive broader changes in national curricula, aligning with societal needs for a more holistic and interconnected education system.

In addressing societal needs, the evolving landscape of science education necessitates transformative changes. To meet the needs of society, science education should adopt this inclusive approach, fostering a curriculum that goes beyond mere subject expertise and considers the broader context of knowledge acquisition and cultural understanding (Csapó, 2002). The infusion of Artificial Intelligence (AI) in learning, as advocated by Niemi, Pea, and Lu (2023), highlights the urgency to align educational institutions with the technological advancements of the 21st century. To meet the demand for a well-rounded education, there is a critical call to redefine science teacher training, ensuring educators are equipped to navigate the intersection of AI and traditional teaching methods.

Moreover, current and future expectations require a reevaluation of how success in mathematics is linked to overall academic well-being, as explored by Rodríguez et al. (2020). This necessitates fostering a sense of perceived competence in students, promoting subject-specific achievements and their holistic well-being. In higher education, the emphasis on STEM and practical training, as challenged by Wu and Pope (2019), prompts a reflection on the role of critical thinking skills. To cater to societal needs, educational systems must prioritise the cultivation of self-reflection alongside critical thinking and reasoning skills, ensuring graduates are adept at navigating complex real-world challenges.

The shift toward integrated STEM education, as demonstrated by Wahono, Chang, and Khuyen (2021), responds to the societal demand for a workforce capable of addressing controversial scientific issues. This approach enhances scientific understanding and instills motivation and self-awareness in students, aligning education with societal expectations for comprehensive learning.
Addressing the well-being of both students and educators emerges as a societal imperative. Initiatives such as the CARE program (Jennings et al., 2013) and mindfulness practices for teachers (Flook et al., 2013) respond to the societal need for a supportive and resilient educational environment. These measures aim to prevent burn-out, ensuring that educators are equipped to foster positive learning experiences.

Science education needs to evolve in response to societal demands for a technologically proficient, well-rounded workforce capable of critical thinking and addressing real-world challenges. Focusing on holistic well-being, integrating AI ethically and responsibly, and fostering a supportive learning environment are pivotal aspects that must be addressed to align science education with the evolving needs of society.

4.

BEST PRACTICES FOR SCISSORS

4. Best Practices for SCISSORS

Educators and leaders can draw inspiration from best practices observed in partner countries such as Hungary, Poland, and Finland as they seek to catalyze meaningful integration of science and social studies in our local educational context. Educators can gain valuable insights into how these countries successfully integrate the two disciplines, which can then be used to spark positive change in our own community. Tailoring interdisciplinary projects to our local context, with a focus on understanding the historical and cultural dimensions of scientific progress, enables us to adapt and implement effective strategies. Collaboration between science and social studies educators, inspired by successful practices abroad, can create a dynamic and enriching learning environment. Embracing these insights from partner countries not only strengthens education's interdisciplinary nature, but also paves the way for a nuanced and contextually relevant examination of the interconnectedness of science and society in our own community.

A. Alternative Schools Leading the Way (Hungary)

Alternative schools in Hungary share many similarities in their approach to education. One of the main focuses is on promoting the humanistic approach, with a special emphasis on the well-being of students. This is achieved through activities such as relaxation, sports, games, and time for play. Additionally, many alternative schools have integrated special needs students into their classrooms. Teaching social skills is also a key aspect of alternative schools in Hungary. Students are taught important skills such as debates, team-building games, discussions, non-violent

communication, and conflict management. This is typically done in a cooperative manner, rather than a competitive one. Cognitive and affective teaching go hand in hand, with a focus on progress rather than results. Evaluations are elaborated and complex, both oral and written, and feedback is given on social aspects as well. Interactivity and creativity are emphasised, and complex, integrated subjects are taught. Teachers aim to build on what students bring to the classroom in terms of activities, objects, ideas, and topics.

A holistic approach is taken to education, with projects, thematic days, and research being common teaching methods. Art is an essential component of many alternative schools, and students are given a lot of choice in the learning materials they use. Skill-building is also emphasised, with students encouraged to develop their abilities and talents. Alternative schools in Hungary often have a focus on ecology, with eco-days, field trips, and outings being common. Many projects are centred on environmental issues, with students encouraged to develop an understanding of the importance of protecting the environment.

Overall, alternative schools in Hungary have more resources and flexibility to connect students with their own self-knowledge through a unique and holistic approach to education, promoting well-being, social skills, creativity, and an appreciation for the environment.

Examplary Primary school first grades

Rogers Kindergarten and Primary School www.rogersiskola.hu

In the choice of teaching methods, they build on the person-centred approach of Carl Rogers, one of the founders of humanistic psychology. According to Rogers, a person has the ability to understand their own behaviour and to change in the light of this understanding. For growth to occur, a safe environment is needed that can facilitate it. This environment is created by people themselves, by reaching out to each other with empathy, with unconditional positive regard, with authentic, open communication, with trust. Their three strategic principles - trust, cooperation and versatile knowledge - help them put the Rogers approach into practice in their everyday lives.

Kincskereső School: www.kincskereso-iskola.hu

A child-centred approach focuses on understanding the changing needs of the developing child and fostering their self-management and personal autonomy. The Kincskereső School spreads this pedagogical culture by training college students and teachers nationwide and serves as a model for integrated education of children with achievement and integration problems in a small community.

Secondary grammar schools

AKG - Alternatíve Közgazdasági Gimnázium (Alternative Grammar School of Economics) www.akg.hu

The general principle of the school is: children are not prepared for life, they live it. AKG is an open, person-centred, alternative school that focuses on the present. They prioritise short-term success, daily pleasures, and conflict resolution for their students. They value freedom, personalization, and interest over institutional control. Their programme is centred on the individual child and emphasises personal relationships and continuous cooperation. They draw inspiration from the reform pedagogies and pedagogical alternatives of the early 20th century and aim to transmit these values to their students.

Kürt Alternative Gimnázium www.kag.info.hu

The Kürt Foundation High School provides a democratic education with equal rights for all members of the school community. Decisions are made at meetings where community members or their representatives participate. The school values informed decision-making through reflection and debate. They have developed an alternative curriculum based on the principle of continuous renewal to address issues of equity, curriculum and school organisation, learning-teaching, and methodology. These reasons are outlined in the following nodes: 1. Equity, 2. Curriculum organisation, 3. School organisation, 4. Learning-teaching organisation, 5. Methodology.

Secondary vocational school: Zöld Kakas (Green Rooster) www.zoldkakas.hu

All the elements of the Green Rooster programme are based on the approach that the development of the individual and the fulfilment of his or her personality is the primary pedagogical goal. The learning process can be based on this: if you are aware of your own abilities and are given the opportunity to show who you are, you will be able to learn more easily and effectively. Each student at Green Rooster follows an individual pathway, learning at their own pace and according to their interests. All the Green Rooster's elements are built on the same foundations. The cornerstones of the approach: Experiential learning, Talent management, Restorative approach, Personal attention, Alternative approaches.

12-year school: Gyermekek Háza: https://www.gyermekekhaza.hu/

Their aim is for the school to provide an accepting, safe environment for all children and young people, to ensure that they have the opportunity to follow their own individual learning path and to educate them to be free, creative, independent and reflective. They accept and value differences. They believe that every child is a bearer of values and has the right to learn in a safe and supportive school environment.

B. Collaborative Projects for Learning (Poland)

In Poland we have a sector of collaborative projects that bring together students from different disciplines to work together on a common project, usually for a small fee (typically equivalent to 5-10$). For example, a science and humanities collaboration could involve students working on a project related to environmental conservation. Students can explore scientific and social aspects of environmental issues and propose solutions that take into account both perspectives.

A good example of such a collaborative project is UndercoverCityGames[1], a form of edutainment launched in five cities in Poland. The project combines local history with a form of an open space escape room. It is designed for both education and leisure time, adults and youth. The estimated age of players is 8-99 years old and the groups must be min. 2 people.

[1] www.undercovercitygames.com/

C. Home Economics Classes (Finland)

The objective of home economics is to cultivate the information, abilities, attitudes, and dispositions necessary to master daily life and embrace a healthy, sustainable lifestyle. The teaching and study of home economics fosters manual skills, creativity, and the ability to make sustainable decisions and act sustainably in daily home life. The education lays the groundwork for the students' knowledge and skill in home economics, i.e., their capacity to operate in various situations and complete domestic activities. Teaching and learning facilitate the students' development into consumers who are able to maintain the necessities of everyday living at home. In home economics, students gain the skills to care for others and mature into contributing members of the family, home, and society (FNAE, 2016, pp. 470-473.).

D. Engame Academy (Hungary)

www.engame.hu

Engame Academy is an alternative educational institution for students in grades 9-12. They offer afternoon and weekend training programmes to complement secondary school education, both in face-to-face and online. The most important values that their work is characterised by are *passion*, *adaptability, making a difference*, *empowerment*, *community and integrity.*

They believe that the best way to complement the experiences and outcomes of public education is to create space for students to articulate their own goals and to help them achieve these. They assist in career orientation, skills development, English language learning and study-abroad preparation both in the form of one-to-one coaching and by the support of the community, peers and professional leaders, In practice, they organise field trips in both national and international companies, Meet the Expert happenings and thematic days on weekends. Several Student Societies operate within the institution.

E. Tutoring (Poland)

https://instytuttutoringuszkolnego.pl/wiedza/

Another form of good practice connected with self-awareness and wellbeing is tutoring. Among many private and local tutoring organisations there is OEA (Open Education Association). Since 2008, on the initiative of the Open Education Association (the body that runs the School Tutoring Institute), the school tutoring method has been developed in many public and non-public schools in Poland. It has already been used by more than 400 schools all over the country.

Individual guidance in a form of tutoring is in our opinion essential from a social-emotional perspective as it gives a whole new level of validation of students' ideas. Both forms - scientific and developmental mode of tutoring allows students to build a model of life-long learning on achieving self-chosen goals.

F. Education Technology - Chatbots for monitoring student wellbeing (Finland)

www.annieadvisor.com

Annie Advisor is a Helsinki based ed-tech company, which utilises chatbot for maintaining wellbeing in diverse classrooms. According to Annie, the majority of students do not seek help early enough. By identifying students who require assistance early on, schools can intervene when it is most effective. Annie, a student guidance bot, uses a simple text message to find students who need assistance with their studies or their well-being. 75% of students respond on average, with 15% having a hidden support need. A great initiation which utilises chatbots for student wellbeing, but it must be mentioned that yet Annie is not available in all schools in Finland, as their operating structure is inevitably a profit-oriented one.

G. EDU&FUN (Hungary)

www.edufunbudapest.hu

This organisation, as the name suggests, offers a space that combine play & learning. While both children and adults are welcome, they main target group are students from primary and secondary schools. They have 1,5-hour-long morning sessions for classes during school-time, afternoon courses and are also open on the weekends for the whole family.

Children can meet humanoid robots, learn about robot programming, 3D printing, visit a smart home, try out augmented reality tools and discover the latest technology trends and they are accompanied on their journey by an outstanding pedagogical team.

They believe that students who learn about modern tools in a playful way through such programmes will not only do better in everyday life, but will also develop a keen interest in complex sciences and IT and will be more likely to choose a career in this field and to succeed in a labour market that is changing due to digitalisation.

H. Science Museums and Centers for interactive learning (Poland)

Another example of good practice in education in Poland are Science Museums and Centers. Science museums and centres are great places for students to learn about science and its relation to the humanities[2]. These institutions offer interactive exhibits, workshops, and lectures that explore the history and culture of science. A rather exceptional example is CNExperyment[3]. They have an interactive, interdisciplinary exhibition, available for the equivalent of 10$, but also cooperation with Polish Academy of Kids, a possibility to enroll the whole group free of charge for an academic year of lectures run by both kids and mature scientists[4].

e.g.

[2] **www.kopernik.org.pl**

[3] **experyment.gdynia.pl**

[3] **experyment.gdynia.pl/dla-grup/polska-akademia-dzieci/**

[4] **www.youtube.com/watch?v=ACkkLP9EMr8**

I. Finn minta: Sharing Finland's Phenomenon-Based Learning Worldwide (Finland)

Finn Minta, which translates to "Finnish Example," is dedicated to promoting Finnish pedagogy, particularly phenomenon-based learning, and facilitating the exchange of best practices among teachers worldwide. Through platforms such as teacher forums, workshops and training, they foster invaluable exchanges that enrich teaching methodologies on a global scale. **Phenomenon-based learning (PhBL)** suggests a holistic approach to learning. It is based on the premise that in order to develop problem-solving skills, school knowledge should be linked to real-world problems. It also combines knowledge from various subjects by putting a specific phenomenon at the centre of the investigation. The phenomenon can be complex concepts like 'poverty' or 'sustainability' that are examined through multiple discipline lenses. The Finnish National Core Curriculum 2016 includes 1-2 PhBL project weeks to be completed per academic year.

In collaboration with Alteredu Nonprofit Kft, Finn Minta embarked on a pioneering project to examine the effectiveness of PhBL in Finnish education. Teachers participating in the project meticulously planned and implemented a PhBL teaching week centred around sustainability, while also documenting the process through video recordings. These materials offer a comprehensive view of PhBL implementation in Finnish schools, showcasing interdisciplinary integration and problem-solving skills development. Building on their success in Finland, they replicated the PhBL week in Hungary, capturing the teaching process on video to promote the exchange of best practices and mutual learning. These videos serve as invaluable professional development materials for educators, offering insights not only into PhBL but also positive pedagogy. Furthermore, they clarify the competency and skill development facilitated by PhBL, providing teachers with practical examples and strategies for implementation.

www.finnminta.com and **www.altereduhungary.org/en/home/**

https://youtube.com/playlist?list=PLj5yegeBehCdXO8iQQXTHrld52ru0BRtP&si=oH7ecC2UexSHtaej

J. Maker's Red box (Hungary)

https://instytuttutoringuszkolnego.pl/wiedza/

Founded in 2015 as a small collective, this organisation has grown to a team of 16 professionals, including engineers, teachers, maker educators, gamification experts, and innovators. At the heart of their mission is a deep belief in the transformative power of makers pedagogy to redefine science education while also addressing the imperative of cultivating social competence. Their pioneering work includes the development of innovative STEAM-focused curricula tailored for children and young adults, as well as a methodology that guides and empowers educators in effectively

utilising technology and modern tools. A standout achievement is their Maker's Red Boxes series, which includes the Green Engineers box. This immersive program casts children as space engineers on a team mission to terraform Mars, promoting social competence through collaborative problem-solving. In addition, the organisation provides equally compelling curricula such as Global Warning, City of the Future, and Superheroes - Digital Storytelling, all of which are strategically designed to inspire creativity while also promoting social competence development among learners.

K. Polish Academy of Kids (Poland)

In the Polish Academy of Kids (PAK) children and scientists work together. PAK encourages all willing Universities to open their doors every month for a reunion of Young Scientists. A monthly reunion consists of two lectures: a lecture given by Young Scientists, aged 6-12, and a lecture given by an academic lecturer. Children are given a set of ICT tools, based on scientific researches, to help them prepare their lectures. They also have an adult mentor to consult, and a Young Scientist (a child who already prepared a lecture in the past) to help.

PAK had cooperated with 24 educational and science centres and Universities in ten cities in Poland, the Czech Republic and the Netherlands. PAK organised lectures for over 8000 children every month in the years 2009 till today. The PAK project is run as a non-profit organisation, the Polish Academy of Kids Association, under the patronage of the Patent Office, the Ministry of National Education, the Ministry of Science and Higher Education, the Foundation for the Development of the Education System, the European Year of Creativity and Innovation 2009, and Rectors of cooperating universities (for details see: akademiadzieci.edu.pl).

L. KnowNow Key (Finland)

(Photo: Jukka Sinnemäki, 2024)

www.knownow.fi/en/hyvinvoinnin-avaimet/

Knownow-key, trailer, leading learning, leading wellbeing

KnowNow Key is a pedagogical program that includes curriculum and a device for the holistic improvement of learning communities' wellbeing. The combination of physical activity, data-collecting 'wearable' sensors, and biofeedback provides positive reinforcement and accurate assessment of the consequences of choices students make regarding their behaviour. Students can learn to control the inputs into their physical-mental balance by embodying learning experiences. This can result in them being in peak condition even in the face of major challenges.

M. CSOPA Science Centre (Hungary)

www.csopa.hu/en/home/

The Palace of Wonders stands as a beacon of scientific marvels, dedicated to unravelling the mysteries of nature and showcasing the awe-inspiring realm of physics in a manner that is both spectacular and accessible. Conceived by the visionary Professor József Öveges in the 1960s, during an era devoid of expansive science centres, it embodies his dream of an institution where visitors could immerse themselves in the enchanting wonders of science. Their mission is clear: to make the natural sciences captivating and easily graspable for audiences of all ages. They strive to provide children with a tangible connection to the physical realities of our world, enabling them to experience it with all their senses, transcending the confines of mere observation that contemporary virtual reality often offers.

Since its inception in 1994 within the auditorium of Budapest University of Technology and Economics, the Palace of Wonders has blossomed into a sprawling 5,000 m2 science entertainment centre nestled in Óbuda. Boasting over 250 interactive exhibits, auditoriums, and laboratories, alongside three immersive projectors, four engaging escape rooms, event spaces, and 27 interactive tables, they offer an unparalleled journey into the heart of scientific discovery. They warmly

welcome groups and individuals alike, ensuring their facilities are fully accessible to those with mobility impairments. In their commitment to inclusivity, they offer tickets at a symbolic price for individuals with disabilities and disadvantaged groups, striving to make the wonders of science accessible to all. Moreover, their Educator's Club stands as a testament to their dedication to education, providing teachers with a platform to join them in their mission free of charge.

N. Programmatic assumptions (Poland)

Versatility of the program is based on introduction of exemplary elements already in class—among other things: astronomy (solar system), physics (examination of liquids, solid bodies), microbiology (microorganisms and their lives), neuropsychology (how does the brain perceive emotions), information technology, and references to Mathew Lipman's concept of *Philosophy for Children* (P4C).

The main assumption of project Polish Academy of Kids is to induce love of knowledge, search for answers, and ask questions. The fact that listeners are not evaluated in any way but encouraged to research and experiments, both physical and intellectual, is a key to success. Young students will become familiar with informational technology devices, prepare their own lectures, participate in classes, and use scientific programs available on-line.

PAK promotes students' independence and creativity in science. After each lecture all participants are encouraged to ask questions. Listeners are not evaluated but are encouraged to perform physical and intellectual research and experiments. Young students are expected to become familiar with ICT tools while preparing their own lectures. Young Scientists are also encouraged to publish their researches in scientific journals (Blackawton *et al*., 2011).

O. MathArt Expressions at 'The World At Play' exhibition (Finland)

The Math-Art Expressions book and exhibition at 'The World At Play' interactive exhibition in Jyväskylä, Finland offers a glimpse into the fusion of mathematics and art in the journeys of South African students. These artworks stimulate cross-disciplinary dialogues, inspiring fresh interactions between materials and creators. This innovative approach empowers learners and educators, fostering critical thinking skills and problem-solving abilities. By integrating art and mathematics, students develop a deeper appreciation for both disciplines, shaping their educational experiences with agency and collaboration.

During the initial weeks of the exhibition, sixth-grade students from Jyväskylä had the opportunity to participate in workshops and guided tours, engaging in thought-provoking discussions about sustainable development, the importance of critical

thinking for the ethical use of Artificial Intelligence (AI), and the actions needed to ensure a sustainable future.

Artworks of South African students

P. Bridging Math and Art: Experience Workshop's Innovative Approach

Experience Workshop, launched in 2008, unites mathematicians, visual artists, educators, parents, and children in a collaborative effort. Operating globally, their diverse network includes educators, artists, scholars, artisans, and toy makers committed to interdisciplinary learning. They advocate for STEM and STEAM education, emphasizing inquiry-based, cooperative, and experiential approaches to mathematics. Their methodology integrates hands-on activities with digital modeling, merging science with art and promoting phenomenon-based, multidisciplinary learning.

Committed to accessibility, Experience Workshop develops educational resources such as books, guides, and articles, many of which are openly available. Their courses are accessible with funding through Erasmus+ or other programs. They offer online and offline training in STEAM, multidisciplinary learning, and Finnish education. Furthermore, Experience Workshop arranges educational tours in Finland for educators and students, along with offering professional development programs and curriculum advisory training. As a pioneering Finnish education company, their aim is to democratize mathematics learning by integrating artistic creativity, fostering dynamic dialogues between children, parents, and educators to bridge mathematical and artistic perspectives globally.

www.experienceworkshop.org

www.learningbydoing.fi (webshop)

5.

SCISSORS IN THE TEACHER EDUCATION CURRICULA IN HUNGARY, POLAND AND FINLAND

5. SCISSORS in the teacher education curricula in Hungary, Poland and Finland

A. National Core Curriculum of Hungary, Poland and Finland

The intersection of sciences and humanities is vital to contemporary education. While the curricula of different countries may share some similarities, it is crucial to examine their differences in approach and focus on essential aspects of education, such as student well-being and teacher training. This chapter aims to review and compare the national education curricula of Hungary, Poland and Finland in terms of their connections between well-being, self-awareness, and science learning.

Hungary **and Poland** have centralised curricula, where the foundation for what is to be taught in schools is determined at the national level. In contrast, Finland has a more flexible approach that allows schools more autonomy in developing their curricula. Hungary has a national core curriculum that outlines the values, knowledge, and learning concepts for compulsory schooling, while Poland and Finland have national frameworks and guidelines that schools must follow. While Hungary and Poland's curricula do not focus extensively on well-being or self-reflection, Finland significantly emphasises these aspects of education. Finland's curriculum highlights student well-being and mental health, a crucial aspect of education in modern times.

In terms of teacher training, **Finland** strongly emphasises the education and professional development of its educators. All teachers must have a master's degree and are provided with extensive professional development opportunities throughout their careers. Poland and Hungary also provide comprehensive teacher training, but it may not be as practice-oriented or valued as in Finland.

Finland consistently ranks highly in international assessments of student achievement and well-being. While Hungary and Poland have shown improvement in recent years, they still lag behind Finland in many areas. The differences in approach to curriculum, focus on student well-being, and teacher training among these countries highlight the importance of examining and understanding the education systems of different countries. Finland's emphasis on student well-being and teacher training may contribute to its success in international assessments. It could serve as a model for other countries seeking to improve their education systems.

B. SCISSORS and Science Teacher Training

In this chapter, we delve into the examination of the science teacher training systems in Hungary, Poland, and Finland, shedding light on how soft skills, self-management, and social awareness are incorporated into the pre-service teachers' courses. This exploration serves to elucidate the nuances of each country's approach and provide a broader understanding of the main characteristics inherent in science teacher training programs. By scrutinising the interplay of these elements, we aim to unravel the distinctive strategies employed to foster subject expertise and the soft skills and social understanding necessary for effective science education.

I. Discontent in the Training of Science Teachers in Hungary

In the major science teacher training program at the Eötvös Loránd University there is no focus on connecting well-being and/or self-awareness to the learning of sciences (*Undivided Teacher Training from 2018*, n.d.). The training is for 5 years for primary school teachers and 6 for those wishing to teach in grade 9-12th. The course is structured in such a way that students need to take all the compulsory subjects and a certain amount of credits from a selection of subjects offered by the school – also subject related.

Students at the teacher training program take '100-130' credits/subject from the department of their area and '100' credits from the School of Pedagogy and Psychology. At the latter, candidate teachers from different discipline study together. In addition to different pedagogical methodology subjects taken here, separate subject-specific methodology is also taught at the department of discipline. Drawing on the experience of a former student enrolled in the correspondence course to become a chemistry teacher (a 1-year-long course requiring a Master's degree in the field), it becomes evident that the two schools exhibit minimal connection. Pedagogical programs within these institutions lack substantial integration or communication, operating independently despite sharing the same parent university.

Nonetheless, it is not to conclude that there have been no innovative initiatives in education in recent years as for instance the Content Pedagogy Research Program (Patkós et al., 2020) run by the Hungarian Academy of Sciences (MTA) shows. The program developed novel methods and material with the focus of research-practise-partnership between researchers and practising educators. It demonstrates that a shift and willingness towards a student-centred approach, towards the idea that knowledge is constructed by the students, an emphasis on cooperative and interactive learning, competence building and problem-oriented educative methods are clearly present more and more in the thinking and teaching in the public education sector as well which I also experienced in my training.

In the field of chemistry, an inquiry-based learning method was tested in which practical activities requiring one or more steps to be designed by the 14-15 years old students were introduced. However, still, next to all these forward-thinking initiatives, the social-emotional learning connected with sciences is less of a topic of interest while other currently also relevant areas get more focus e.g. digital transformation in schools. Inaugurated in September 2022, a new course appeared on the palette named "Z" referring to the future teacher generation, generation Z (*Z-Szak Tábor*, n.d.; Barna, 2022). The MSc program is a result of a collaboration of 7 universities across Hungary with the aim to provide a training course where students learn about and understand ecological sustainability and tangible nature through practice-oriented, problem-solving techniques. They constructed a STEAM program in which the more effective absorption and assimilation of STEM ideas are coupled with forms of communication that are open to the arts (e.g. visuals) and that appeal to the emotions, and later on, more effective transmission of ideas". Within public education, this diploma allows students to teach science, as well as biology, physics and chemistry, in grades 5-8. According to Tamás Weiszburg[9], one of the "engines"of the program, the novel course has also the ambition to counterbalance the massive

teacher shortage in the country by training future teachers that are competent and can pass on the love of these subjects to next generations' members who then could develop more motivation towards teaching sciences, and choose it as a profession.

At this point, facts around the teacher shortage in Hungary cannot go without mention. The number of teachers aged above 50 was 46,5%, while this number for the ages below 40 was about 20% according to the latest OECD data (OECD, 2024). A study that focused on examining external factors of the huge chemistry and physics teachers' shortage confirmed that teachers' salaries are the most important reason for the decrease in the number of applications to teaching professions (Polónyi, 2022).

According to the latest teacher career and pay scale model - established by the Act CXC of 2011 (on National Public Education) and entered into force on 1 IX 2013 - there exists five grades within the profession: trainee, teacher I, teacher II, master teacher and research teacher. The first three of these grades build on each other, with the possibility of progression being split into two different grades after reaching the level of teacher II (*Mit Kell Tudni Az Életpályamodellr*?*l?*, 2013). Another study looked into the influence of this system on the wage levels in national and international comparisons, on entry scores and the number of language exam certificate holders within students enrolled in teacher training and on changes in the age structure of teachers (Polónyi, 2019). It found that the impact of the teacher career model on pay has not led to a breakthrough in the situation of teachers in Hungary. In fact, it has created a very unfavourable situation in terms of starting salaries, which is likely to have a negative impact on career entry. Overall, the teacher career model favours rather older, in-service teachers and less early career teachers, thus contributing to the ageing of the teaching workforce. And the ageing of the teaching force appears to have serious consequences for student achievement - both reading and academic PISA results suggest this negative impact. In 2021, teachers' salaries in Hungary were the fourth lowest (22928 USD, following Brazil, Latvia and the Slovak Republic) as shown within all available data in the OECD database (OECD, 2024).

When examining the causes, related recent events must be mentioned. Calls for improvements to the education system and an immediate pay rise for teachers have been growing. In January 2022 the two major trade unions called a two-hour warning strike over the inconclusive negotiations with the government. This was subsequently ruled unlawful by the Budapest Court of Appeal, and a day later the government issued a decree on how teachers could strike, which many said made it practically impossible for teachers to protest, leading many to opt for civil disobedience. In early September, school districts sent letters threatening teachers who participated in civil disobedience, then, in the autumn, dismissals of such teachers began (Szopkó, 2022).

Thus, when developing output practical material for the current project, it is important to keep in mind the social-political context where it is to be introduced.

Finally, a few words about further professional training should be mentioned. As the relevant article (Oktatási Hivatal, 2024) states: "*From the first working day of September of the seventh year following the award of the diploma entitling the holder*

to hold the post of teacher until the last working day of August of the year in which the teacher reaches the age of fifty-five, the teacher shall participate in the continuing education regulated by Article 62 (2) of the Act. Continuing education and training shall be completed by attending at least one hundred and twenty classes per week, in one or more continuing education and training courses, and by meeting the prescribed academic requirements."

The list of the accredited training programs is long (*Pedagógus-Továbbképzések Jegyzéke*, n.d.). According to teachers at Rogers School in Hungary, there are better and worse ones but many times it is hard to know in advance. Currently, 24 kinds of programs can be found on *environmental education*. An interesting one close to the subject of the present project holds the title *Let's learn from nature! Training on the use of biomimicry in education* (*Tanuljunk a Természett*[?]*l! Továbbképzés a Biomimikri Oktatásban Való Alkalmazásáról*, n.d.).

II. Poland's first signs of relational approach towards teacher training

As far as standard procedures in Poland are concerned prospective teachers typically pursue a degree in education with a specialisation in a specific subject area such as biology, chemistry, or physics. They attend universities or pedagogical colleges where they receive theoretical knowledge and practical skills related to teaching. Usually, it is mostly theoretical during the first three years and practical skills are introduced during the last two years after the teacher's pedagogical specialisation (in the course of 5 years' studies); unfortunately it is not sufficient (from 250 - 400 hours) and most importantly, not well supervised. Another option is to undergo pedagogical training, which covers topics such as educational psychology, teaching methods, curriculum development, and classroom management.

Teacher training programs in Poland include practical components where aspiring teachers gain hands-on experience through teaching practices, internships, and classroom observations. This allows them to apply theoretical knowledge in real-world teaching settings under the guidance of experienced mentors, nevertheless the balance between theory and practice is always put on the knowledge of the subject rather than the skill of teaching. Overall, science teacher training in Poland emphasises a combination of subject expertise, pedagogical knowledge, and ongoing professional development to ensure that educators are well-prepared to effectively teach science and foster student learning and engagement in the subject. Nevertheless, there is not a sufficient number of hours devoted to practical skills and training (and no high quality supervision) as well as very little emphasis on a holistic approach results in a huge gap between what young teachers' expect and mainstream schools' reality presents.

School of Education (Szkoła Edukacji) is an example of an initiative combining social-emotional competencies and science teaching training (*Szkola Edukacji*, n.d.). School of Education runs a free full-time postgraduate programme for teachers - both prospective and already active. The programme aims at development of pedagogical

and didactic competencies. They educate within the framework of four subject pathways: Polish language, history and WOS (Social and Political Sciences), biology with nature, mathematics. Since 2015 they have educated over 65 000 teachers. Tuition at the School of Education is free of charge; students can also receive scholarships and - if necessary - a free dormitory room. Upon graduation, graduates receive a diploma from the University of Warsaw and are qualified to teach in primary and secondary schools.

One example of such courses is The Thinking Classroom Method, which is based on a simple premise: children in the classroom are not necessarily motivated or engaged to think. However, small modifications in the teaching approach are enough - such as relational introductions, empathic circles or physical activity - so that pupils begin to reason actively - this is proven by the scientific research conducted by Dr Liljedahl's team (Liljedahl et al., 2021). The workshop introduces the Thinking Classroom method in mathematics and Polish lessons. The course is aimed at teachers of mathematics and Polish language and takes place in subject groups. The aim of creating a platform for active engagement is to equip teachers with tools to start lessons in such a way that students get involved in the lesson from the first minute, such as mentioned above tools, develop good problem-solving tasks that require in-depth thinking rather than using already known patterns (*Myslaca Klasa*, n.d.).

Another example is the Nansen Dialogue course (*Iceland Liechtenstein Norway Grants*, n.d.), which is a part iof School of Education (Szkoła Edukacji). It is a way of communicating that focuses on understanding the other rather than trying to convince you of your reasons. It is a humble process in which we approach the other as a human being with their needs and feelings (*Nansen Fredssenter*, n.d.). In Nansen dialogue, social status, position and formal power relationships have absolutely no meaning. The essence is to try to understand *the other* and to recognise *the other* as a person. This does not mean accepting his or her views and values, but respecting the right to express them. Understanding *the other* makes it possible to build the lasting relationships that make up societies. This is undoubtedly a challenge especially when the level of conflict in a society is high and divisions are deeply rooted. In divided communities, the great challenge is to find the space needed for all parties to come together and feel safe.

However, without creating a supportive and safe space where participants can share their experiences, feelings and thoughts, dialogue is not possible. An attitude of dialogue is based on the desire to understand the other person and the conviction that judgements made on the basis of prejudice have limited validity. Unfortunately, there are many such cases where people refuse to meet the other person based on the opinions they have about him or her. It is a simple yet powerful tool for building a community based on respect and kindness.

III. Fostering Self-Awareness in Finnish Science Teacher Training

In Finland, teacher education is carried out at eight universities, where students are required to receive a master's level diploma and training including at least 120 ECTS worth of courses. After their bachelor degree, each student is required to participate in a teaching practice at a university teacher training school. The teacher training schools, which belong to the education faculties at universities, play a significant role in the preparation of potential teachers, including science teachers as well . In general, Finnish teacher training is research oriented, as it aims to equip future teachers to be able to constantly develop themselves (Hammerness et al, 2020). The feedback and evaluation culture in Finnish education on itself greatly impacts the self-assessment competencies of all learners, as it can provide multiple opportunities for the individualisation of learning, and space for discussion, reflection and sharing constructive feedback in the online and in-person classrooms (Hautopp & Ejsing-Duun, 2020). Group work and co-teaching in teacher training are applied, which provide meaningful experiences for pre-service teachers to realise the potential of collaborative teaching and learning as well as the power of self-awareness (Sundqvist et al, 2023).

This chapter introduces science teacher training and its connections to wellbeing and self-awareness, based on an interview with Anssi Lindell, senior lecturer in the Teacher Training Institute of the University of Jyväskylä (Lindell, 2023).

Science teacher training is divided into two main groups based on the age of the students. Primary school teachers learn to teach science among all the other school subjects for the grades 1-6. Some students decide to become subject teachers in high school education with learners aged 13-15 and 16-18. Primary school pre-service teachers attend 60 ECTS worth courses in general education pedagogy study education as their main subject and they learn 60 ECTS on the pedagogy of different subjects. The latter is already taught during bachelor degree studies, for instance in courses such as 'Multidisciplinary Studies in Subjects' and 'Cross-Curricular Thematic Modules Taught in Basic Education' (Bachelor's Degree Programme in Primary Teacher Education, 2023). The case of subject teachers is different as they belong to a specific main department of their choice, where they learn 60 ECTS of their respective scientific field as well as 60 ECTS of pedagogy, 25 ECTS of this belongs to the bachelors and 35 ECTS to the Masters degrees. As a result, primary school teachers receive a master's degree in education, while subject teachers graduate in their respective faculties (Physics, Chemistry, Biology, Geography).

According to Lindell, the teacher training curriculum of the University of Jyväskylä includes two compulsory courses which are great examples of incorporating wellbeing and self-awareness into the education of pre-service teacher students. The Interaction and Cooperation course (5 ECTS) entails topics as group phenomena and group management, building inclusion in a community, ethics of pedagogical interactions as well as diversity, wellbeing, social and scientific competencies (OPEA215 Vuorovaikutus ja yhteistyö, 2023). Upon completing this course, students become aware of the connections of interaction and emotional life to learning

and they are capable of managing a diverse school community through improved interaction and problem-solving skills. The Education, Society and Change course (4 ECTS) discusses the school as a social institution and strengthens competence areas (OPEA315 Kasvatus, yhteiskunta ja muutos, 2023). It improves core competence areas, such as community and social competence, interaction and diversity-related competence, pedagogical competence, but also ethical competence, well-being competence, aesthetic competence and scientific competence. After completing the course, teachers gain an understanding on how social trends affect a school, how to act actively and ethically in changing and diverse communities and how to develop school democracy, learner participation and act in accordance with global responsibility at work.

Lindell highlights that pre-service science teachers are growing their self-awareness by having a great autonomy in choosing what topics they study or research. In subject pedagogy courses, wellbeing and self-awareness are mainly exposed through allowing students to have a great deal of freedom and responsibility in choosing which kind of learning tasks they feel relevant and worthy of gaining ownership. Having the opportunity to individualise the theme of the assignments, for instance designing a module for teaching a given scientific subject, topic or investigating learning in different environments. Research tasks are often given to students to collect data in a classroom, analyse it and prepare a scientific report, the topic of which tends to be connected to wellbeing and motivation. They are encouraged to find the pathway of practising self-reflection and in this way they need to learn to understand the growth process of their future students through self-awareness. Through getting autonomy, they are already becoming more and more aware of their interests, strengths and weaknesses which guides them in finding their own path for teaching and learning.

C. Comparing Science Education and Wellbeing Practices

In this concluding section, we delve into a multi-dimensional comparative summary of the best SCISSORS practices in the National Core Curricula and Science Teacher Training of Hungary, Poland, and Finland. The aim is to uncover mutual learning opportunities and identify actionable improvements for teaching and teacher training by exchanging insights. Education systems wield substantial influence over the wellbeing and self-awareness of students. Examining Poland, Finland, and Hungary brings to light varying approaches and challenges concerning these dimensions.

In Poland, the educational paradigm adheres to a traditional, transmissive model. The core curriculum does not formally incorporate wellbeing, self-awareness, or science classes with an emphasis on social-emotional competencies. Nonetheless, localised and national efforts are evident as teachers and organisations endeavour to integrate practices prioritising these aspects. Pertinently, Poland contends with the second-highest youth suicide rate in Europe, underscoring the growing recognition of wellbeing's significance. Initiatives encompass mindfulness practices and peer mediation programs, fostering social and emotional aptitude among students. The School of Education initiative merits attention, enlisting over 65,000 teachers in free online courses that underscore wellbeing alongside subject mastery. Remarkably, tutoring emerges as an instrument fostering social-emotional skills and academic advancements, while mindfulness training shows promise in mitigating teacher stress and burnout.

Contrastingly, Finland adopts a holistic stance through its National Core Curriculum, intertwining wellbeing and self-awareness throughout all educational levels. While teaching methodologies exhibit variance, approaches like phenomenon-based learning and lifelong learning methods echo a commitment to student

welfare. Higher education institutions extend initiatives beyond rudimentary services, encompassing psychological and emotional wellbeing, a testament to their recognition of mental health's pertinence within education. The conceivable potency of a national-level platform for collaboration and knowledge dissemination emerges as a latent opportunity. However, the challenge of students hesitating to avail of wellbeing services despite their availability beckons further investigation into patterns of seeking assistance.

Meanwhile, Hungary grapples with a paucity of readily accessible methodological backing within its core curriculum for the integration of wellbeing and social skills education. Notable is the emergence of individualised good practices for pedagogy in science and social domains, often found within alternative schools. Teacher training programs prioritise subject expertise, with nascent shifts toward student-centred methodologies and emotional learning. The "Z" teacher-training course stands as a beacon of promise, melding STEM concepts with emotive appeal, addressing teacher shortages, and enhancing idea dissemination. The urgency of addressing teacher deficits is underscored, given its implications for student performance.

These regions share common challenges linked to global crises and domestic factors impacting student mental wellbeing. Technological deployment, including AI, could serve as an enabler for collaboration and wellbeing enhancement. In Poland, the shift from reactive crisis management to proactive prevention through nationwide programs incorporating positive psychology offers a trajectory for transformation. In Finland, technology and concerted efforts might amplify wellbeing promotion. In Hungary, while methodological support remains a hurdle, progressive practices hint at untapped potential, awaiting amplification. In the face of differing contexts, tailored strategies aligned with technology and collaborative frameworks emerge as pivotal levers for enriching both student wellbeing and science education.

In summary, Poland, Finland, and Hungary exemplify distinct trajectories in assimilating wellbeing and self-awareness within their education systems. While Finland stands as an exemplar of holistic integration, Poland and Hungary demonstrate embryonic yet promising strides in innovative practices amid traditional structures. Collaborative frameworks, technology, and targeted strategies emerge as common denominators that hold the potential to propel progress in nurturing both student wellbeing and robust science education across these diverse contexts.

6.

RECOMMENDATIONS

6. Recommendations

Recommendations for introducing SCISSORS into teaching practices in public education

Integrating the innovative teaching framework known as Science and Social Studies Rethought in Schools (SCISSORS) into public education has the potential to enhance learning outcomes in Hungary, Poland, and Finland. This framework proposes novel strategies for incorporating scientific and social studies concepts into the curriculum, resulting in a more engaging and interdisciplinary approach to learning. This chapter offers practical recommendations and concrete examples of how educators in these countries can successfully incorporate SCISSORS into their teaching practices, fostering student curiosity, deep understanding, and active engagement.

A. Hungary

The current state of the Hungarian education system reflects an antiquated structure rooted in a less democratic paradigm, eliciting responses from today's student generation characterised by depression, anxiety, and various psychological distresses. Concurrently, educators grapple with burnout, low income, and a notable lack of recognition for their dedicated efforts. This predicament is particularly pronounced in the realm of science teaching, partly owing to its perceived alienation, resulting in science educators becoming increasingly marginalised in Hungary. Recognizing the urgency of addressing the prevailing challenges, the focal point should be on well-being and self-awareness. It is imperative to view our human world and environment as integral components of nature. A transformative approach

to general scientific knowledge and the teaching of natural sciences is essential. The SCISSORS project seeks to provide a practical solution for this paradigm shift, adopting a person- and student-centred approach that acknowledges our diversities. This initiative not only brings together educators from arts, sciences, and humanities but also envisions the development of a pioneering curriculum.
In addition to proposing a novel curriculum, we advocate for new methods of learning that can attract researchers and specialists to contribute to the field of education. Below, we present a collection of ideas aimed at seamlessly incorporating this concept into everyday life, thereby fostering a positive shift in the education landscape and nurturing the well-being of both students and educators alike.

I. Educators, Administrators, Principals

For educators, administrators, and principals seeking to enhance the educational landscape, a transformative shift in focus is imperative. Embracing innovation over a narrow fixation on security fosters an environment that encourages creativity and adaptability. Transitioning from a traditional, single-teacher-centric model to one grounded in value-based collaborative thinking and training empowers both educators and students alike. In this paradigm, the emphasis shifts from the mere delivery of learning material to actively facilitating the learning process, nurturing critical thinking and independent exploration.

Beyond the confines of data accumulation, the spotlight turns to skill-building, recognizing the importance of equipping learners with practical abilities for the real world. Breaking free from obligatory lessons, a flexible timetable emerges, allowing students to choose lessons that align with their interests and aspirations. Further, the evolution from isolated lessons to immersive project days addresses complex issues, fostering a holistic understanding of interconnected subjects. Finally, the move from closed classes to the integration of mixed-grade lessons promotes inclusivity, collaboration, and a more dynamic educational experience for all.

II. Policymakers, decisionmakers

For policymakers aspiring to shape an educational landscape that aligns with the evolving needs of our society, there are several key considerations that warrant attention. Firstly, the introduction of social skills and self-awareness at an early age within the school curriculum stands as a transformative step. By normalising and emphasising the significance of human connections as fundamental aspects of life, we cultivate a foundation that not only nurtures individual growth but also fosters a sense of community and interconnectedness.

Furthermore, a strategic shift from divisive approaches to collaborative endeavours is crucial. Policymakers can play a pivotal role by not only endorsing but also legitimising and subsidising multidisciplinary social and scientific research. Recognizing that complex global challenges, such as environmental disasters and sustainability, exist at the intersection of social and scientific realms underscores

the need for a comprehensive educational attitude that transcends traditional disciplinary boundaries. In this pursuit, placing a strong emphasis on integrating the European Union Sustainable Development Goals (SDG) into school curricula becomes paramount. By making these goals a focal point, policymakers can instil a sense of responsibility and global awareness in students, motivating them to actively contribute to addressing pressing societal and environmental issues.

Lastly, empowering teachers with the freedom to shape curricula is essential. This autonomy not only acknowledges their expertise but also encourages innovation, adaptability, and a dynamic response to the evolving educational landscape. Policymakers, by recognizing and addressing these facets, have the opportunity to pave the way for a more holistic, interconnected, and forward-thinking education system that prepares students for the challenges and opportunities of the future.

III. Teachers

For educators committed to fostering resilience and navigating uncertainty in their students, a reflective and proactive approach is key. To effectively teach resilience, teachers must embody and practise it themselves, serving as role models for adaptive coping mechanisms and a positive mindset amid uncertainty. As a teacher, set your sights on broader goals that extend beyond mere content delivery—prioritise attitude-shaping and long-term personal development as integral components of your teaching philosophy. Recognizing your own limits is crucial in this journey. Initiate changes in your routines gradually, ensuring that the adjustments align with your comfort and safety. Begin by understanding your own needs and boundaries, and then gradually extend this consideration to your colleagues, fostering a supportive and collaborative environment within the teaching community.

Forge partnerships with fellow educators, acknowledging the wealth of knowledge and perspectives that can be gained from collaboration. Invest in learning Nonviolent Communication (NVC) to enhance your communication skills and cultivate an environment of understanding and empathy. Break down disciplinary barriers by collaborating with colleagues from seemingly disparate fields—whether it's joining forces with a chemistry teacher when you teach literature or vice versa. Embrace interdisciplinary cooperation to enrich the learning experience and offer students a holistic perspective.

Incorporate students into the decision-making process by involving them in choosing topics and designing lessons. Implement participatory environmental education, encouraging active engagement and ownership of the learning process. Place a premium on self- and written evaluation, constructing and communicating clear evaluation criteria. Additionally, actively seek and incorporate students' feedback, creating a feedback loop that enhances the effectiveness of your teaching methods. By embracing these principles, educators can create a dynamic, resilient, and collaborative learning environment that empowers both teachers and students for long-term success.

B. Poland

The integration of science and humanities within the framework of public schools in Poland remains a relatively uncommon practice. Noteworthy exceptions, such as alternative education institutions like creoGedania, represent rare instances where teaching science is coupled with a dedicated focus on the well-being of students. Despite this, there is a discernible positive trend emerging, characterised by an increasing number of workshops and conferences in Poland that specifically address the vital aspect of well-being in education.

While the conventional educational landscape may still be evolving in terms of combining the realms of science and humanities, alternative models like creoGedania exemplify the potential benefits of intertwining these disciplines. Such innovative approaches not only enrich students' academic experiences but also prioritise their overall well-being. Moreover, the growing presence of workshops and conferences dedicated to well-being in education signals a broader acknowledgment of the importance of holistic development in the Polish education system. As these positive trends continue to gain momentum, there exists an opportunity to inspire broader systemic changes that embrace a more comprehensive and integrated educational approach.

In addressing the specific context of Polish public schools, science teacher training should prioritise education on wellbeing and self-awareness. Given that official data ranks Poland as the second country in Europe with the highest youth suicide rate, it underscores the imperative for prevention programs, particularly focusing on depression. These programs should extend beyond extracurricular activities and become integral components of the main syllabus, incorporating science education as a means of holistic wellbeing.

I. NVC (non-voilent communication) workshops and practices

Generally, participation in NVC workshops, practising minimediations (and other forms of conflict-solving methods) mindfulness-based programs improves teacher wellbeing. There are many programs implemented into school and higher education focused on wellbeing and social-emotional skills. Research shows that globally their impact is significant on both teachers as well as students. „Teacher wellbeing, efficacy, burnout-related stress, time-related stress and mindfulness significantly improve when teachers participate in the CARE (Cultivating Awareness and Resilience in Education) for Teachers program, according to Penn State researchers."

II. Mindfulness with students and teachers

Engaging in mindfulness practices has emerged as a powerful tool in mitigating stress and preventing burnout, particularly for educators. A recent study conducted by the Center for Investigating Healthy Minds (CIHM) at UW-Madison's Waisman Center sheds light on the positive impact of mindfulness training on teachers' well-

being. The findings reveal that teachers who incorporate mindfulness into their daily routines demonstrate a remarkable ability to reduce their own stress levels and safeguard against burnout. Mindfulness, characterised by the cultivation of present-moment awareness and non-judgmental attention, provides educators with practical techniques to navigate the challenges inherent in their profession. By fostering a state of mindfulness, teachers can enhance their emotional resilience, maintain a healthy work-life balance, and ultimately contribute to a more positive and supportive educational environment.

These insights underscore the potential benefits of integrating mindfulness practices into teacher training programs and professional development initiatives. Empowering educators with the tools to cultivate mindfulness not only enhances their personal well-being but also ripples positively into the classroom, fostering a conducive learning environment for students. As mindfulness gains recognition for its profound impact on teacher stress and burnout, its incorporation into educational frameworks becomes an important consideration for nurturing the overall health and effectiveness of the teaching profession.

III. Focus on soft skills' competencies

The intersection of social and emotional skills with academic performance is a compelling area of study, and recent research underscores the positive impact such programs can have on students. According to a forthcoming study in the American Educational Research Journal (AERJ), classroom initiatives aimed at enhancing elementary school students' social and emotional skills demonstrate a notable correlation with increased achievement in reading and maths. Remarkably, these academic gains persist even when the primary objective of the skills-building programs is not academic improvement, highlighting the broad-reaching benefits of holistic skill development.

The study further emphasises that these positive outcomes are not limited to students within specific socio-economic backgrounds, indicating a universal applicability across diverse student populations. This suggests that fostering social and emotional skills within classrooms contributes not only to personal development but also to tangible academic advancements. Interestingly, the incorporation of a general focus on soft skills, including within science education, remains more prevalent in private and alternative schools in Poland. While this approach may be more widespread in certain educational settings, the promising outcomes demonstrated in the research advocate for a broader integration of social and emotional skill development across diverse classroom environments. This insight encourages educators and policymakers to consider the potential academic benefits of prioritising holistic skill-building, reinforcing the interconnectedness of personal and academic growth.

C. Finland

In refining the Finnish education system, a strategic focus on the integration of science and social studies is paramount. This chapter emphasises the significance of infusing these subjects with well-being and self-awareness, ultimately leading to a more enriching educational experience for students.

I. Elevating Teacher Training through the Integration of Well-being and Self-awareness

Upon delving into various science teacher training programs in Finland, we uncovered exemplary practices that have significantly elevated the educational landscape. However, our aspiration to enrich science and social studies education calls for a broader transformation — extending the integration of well-being and self-awareness training to encompass all educators. This shift demands a recalibration of teaching methods, empowering teachers to seamlessly incorporate these principles into their classrooms, while concurrently nurturing their own self-awareness and fostering a critical mindset.

At the heart of this transformative initiative is the development of a comprehensive curriculum that intricately weaves together the principles of well-being and self-awareness. This multifaceted approach not only deepens students' comprehension of societal dynamics and scientific concepts but also actively cultivates their emotional intelligence, contributing to their overall personal and academic development. The case study meticulously detailed in this ebook serves as an exemplary model for other teacher training programs, offering invaluable insights and pragmatic strategies for the seamless integration of well-being and self-awareness into the educational framework.

This concerted effort represents a pivotal stride towards shaping educators who transcend mere subject proficiency, actively engaging in the holistic development of their students. By fostering a mindful and empathetic educational environment, we pave the way for a generation of learners equipped not only with academic knowledge but also with the emotional resilience and self-awareness essential for navigating the complexities of the world.

II. Fostering Knowledge Sharing in Science and Social Studies Education

The imperative to foster collaboration among educators, institutions, and initiatives dedicated to science and social studies is undeniable. While our exploration has unveiled commendable practices in Finland, the potential for further enrichment lies in the expansion and formalisation of collaborative efforts. It is recommended that local and national collaboration be intensified, leveraging the wealth of great practices already in existence but not yet widespread.

To catalyse this collaborative momentum, the establishment of a national-level platform is proposed. Such a platform would serve as a hub for the exchange of best practices, resources, and innovative teaching approaches, thereby enhancing the overall effectiveness of science and social studies education. By creating a dynamic space for educators to share insights and experiences, we can collectively elevate the standards of education, fostering a community of practice that thrives on collaboration and continuous improvement. This collaborative ethos not only benefits individual educators but also contributes to the broader goal of cultivating an enriched and cohesive educational landscape in Finland.

III. Harnessing Technology for Enhanced Learning in Science and Social Studies

In the ever-evolving landscape of education, the strategic integration of cutting-edge technology stands as a powerful catalyst for transformation. Incorporating educational technology, including artificial intelligence (AI) and interactive platforms, into the realms of science and social studies education holds immense potential for cultivating personalised learning experiences. This not only tailors education to individual student needs but also nurtures a profound understanding of the subjects, fostering critical thinking and problem-solving skills.

As AI continues to evolve and embed itself in educational practices, it becomes imperative for teacher trainers to not only acknowledge its presence but actively embrace and leverage its capabilities. Recognizing the novelty of AI in education, it is understandable that many educators find it challenging to incorporate these technologies into their teaching methods. Thus, a concerted effort is required to establish clear guidelines and provide practical tools for instruction, ensuring that educators are equipped with the knowledge and resources needed to navigate this technological frontier effectively.

By embracing technology as an ally in education, we not only enhance the learning experiences of students but also equip educators with the tools to navigate the evolving landscape of teaching. The judicious integration of AI and interactive platforms serves as a testament to our commitment to staying abreast of technological advancements, fostering a dynamic and forward-thinking educational environment.

Regarding innovative learning environments, as spaces for creative learning, the integration of maker spaces into the Finnish education landscape represents a pivotal shift towards a more innovative, hands-on approach to learning. These creative environments, where students can engage in exploratory and project-based activities, offer a unique opportunity to blend theoretical knowledge with practical application. By incorporating maker spaces into schools, Finland can further enhance its reputation for educational excellence, fostering an environment where students are not only consumers of knowledge but also creators.

Maker spaces serve as incubators for creativity, critical thinking, and collaboration—skills that are increasingly vital in today's rapidly changing world. They provide students with the tools and freedom to experiment, innovate, and solve problems in tangible ways. This hands-on approach to learning can significantly deepen students' understanding of scientific and social concepts, making education more engaging and relevant to their lives.

Furthermore, the inclusion of maker spaces aligns perfectly with Finland's educational philosophy, which emphasises the importance of student-centred learning, well-being, and holistic development. These spaces can become vital resources for teachers, offering new ways to integrate cross-curricular themes and foster interdisciplinary learning. By encouraging students to work on projects that combine elements of science, technology, engineering, arts, and mathematics (STEAM), maker spaces can help break down the traditional barriers between subjects, promoting a more integrated and cohesive learning experience.

The potential benefits of maker spaces extend beyond academic achievement. They can play a crucial role in developing soft skills such as resilience, adaptability, and perseverance. As students work through challenges and setbacks in their projects, they learn the value of persistence and the importance of learning from failure. These experiences are invaluable in preparing students for the complexities of the real world, where problem-solving and adaptability are key to success.

In conclusion, the integration of maker spaces into the Finnish education system offers a forward-thinking approach to learning that is in line with the country's educational goals and values. By providing students with the resources to explore, create, and innovate, Finland can continue to lead the way in educational excellence, preparing its students not just for academic success, but for lifelong learning and personal growth.

IV. Global Challenges and Local Solutions in Finland

In crafting a curriculum that resonates with the dynamic nature of our world, it becomes crucial to integrate discussions on current global challenges into the science and social studies educational framework. By doing so, we not only enhance the relevance of the curriculum but also capture students' attention through real-world applications. Encouraging students to analyse and propose solutions to these challenges prepares them to navigate the complexities of our rapidly evolving global landscape.

A stellar example of such contemporary challenges is the discourse surrounding climate change. Approaching this topic from both scientific and social perspectives not only fosters a comprehensive understanding but also instil a sense of responsibility and awareness among students. Beyond the academic realm, it is equally vital to create spaces for pre- and in-service teachers to engage in discussions about how global challenges, such as the climate crisis or pandemics, have personally impacted their lives. This reflective approach not only deepens self-awareness but also contributes to the overall well-being of the educational community.

In essence, by intertwining discussions on contemporary global challenges within the educational fabric, we cultivate informed, socially conscious individuals who are not only well-versed in their academic pursuits but also equipped with the critical thinking skills and resilience needed to address the multifaceted challenges of the modern world.

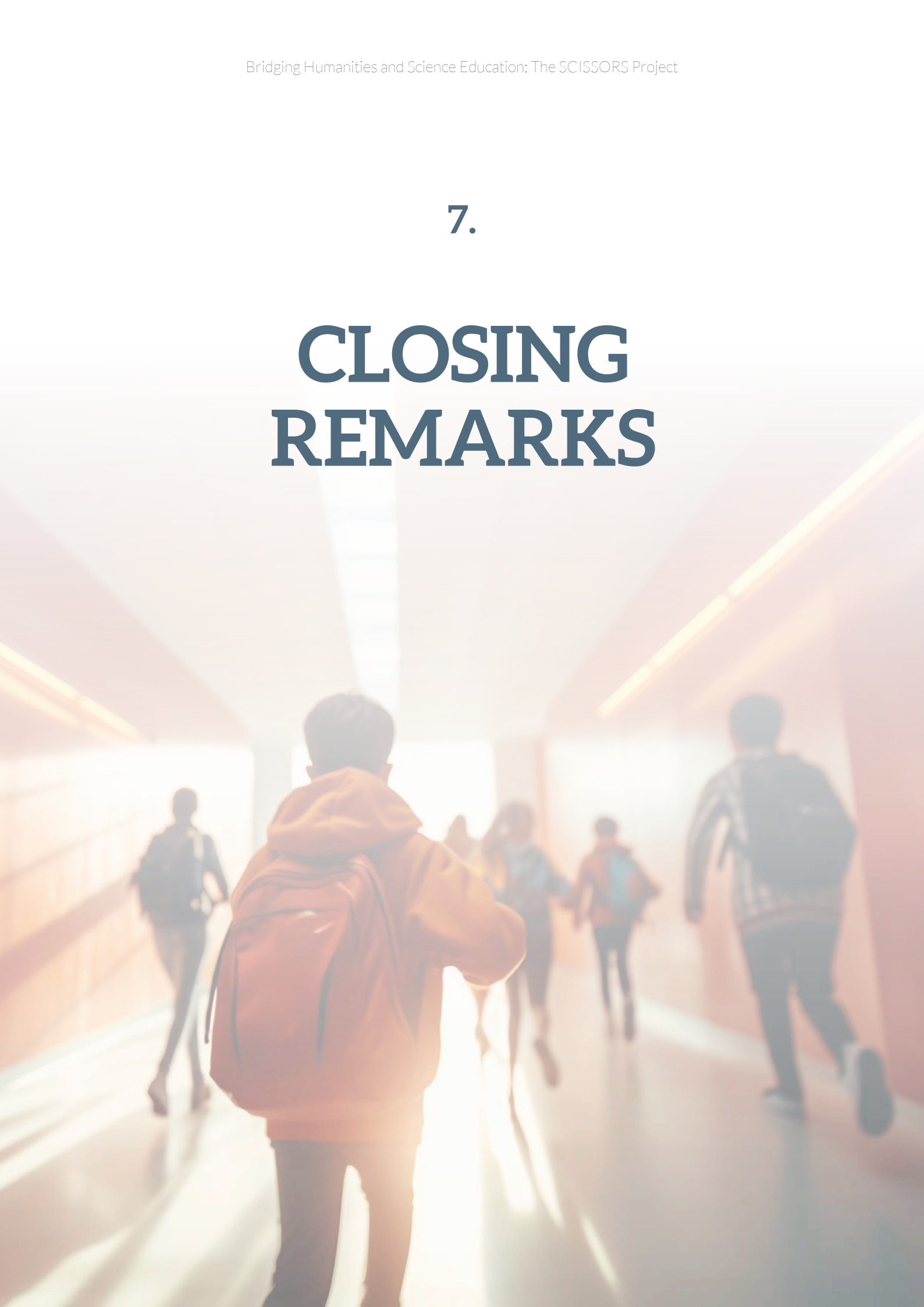
V. Importance of Research-Led Enhancement of Education

A commitment to continuous research and assessment forms the bedrock of ensuring the seamless integration of well-being, self-awareness, and contemporary issues into science and social studies education. This dynamic approach not only safeguards the effectiveness of the curriculum but also allows it to evolve in tandem with the ever-shifting educational landscape, ultimately catering to the evolving needs of modern students. The present ebook stands as an exemplar of research-led improvement, poised to reach educators and decision-makers in the realm of educational development.

In the quest for refining the Finnish education system, a targeted and research-informed approach to integrating well-being, self-awareness, and current global challenges into science and social studies education emerges as pivotal. This strategic alignment of subjects with the well-being of both students and teachers, coupled with a keen responsiveness to the demands of the present and future, positions Finland to nurture a generation of individuals who are not only well-informed but also equipped with the skills to navigate the complexities of the contemporary world. By placing research at the forefront of educational evolution, Finland can ensure that its education system remains a beacon of innovation and adaptability.

7.

CLOSING REMARKS



7. Closing Remarks

In the final act of the Science and Social Studies Rethought in Schools (SCISSORS) Project, we stand at the confluence of vision and practicality, witnessing the emergence of a new era in education. The project commenced with a vision of dismantling the walls segregating the sciences and humanities, advocating for an education that seamlessly intertwines social competencies and scientific concepts. SCISSORS set out to transcend traditional boundaries, envisioning a curriculum that transcends subject silos and embraces a holistic learning experience.

From the project's inception, where the prospect of an interdisciplinary education beckoned, to the practical counsel offered to educators in Hungary, Poland, and Finland, SCISSORS has embarked on a profound journey to redefine educational paradigms. For Hungary, where the echoes of a bygone educational era lingered, our recommendations urged a shift from security to innovation, from isolated lessons to project-based learning, and from data-centric approaches to skill-building endeavours. The spotlight on teacher well-being and collaborative, value-driven mindsets presented a roadmap for transformative change.

In Poland, where the convergence of science and humanities was a less traversed path, we highlighted the impact of well-being workshops and mindfulness practices on teacher efficacy. The focus on soft skills' competencies, particularly in private schools, illuminated a promising trajectory for incorporating SCISSORS into the educational narrative.

In Finland, celebrated for its education system, we underscored the importance of intertwining well-being and self-awareness with science and social studies. Collaboration, the integration of technology, addressing contemporary global issues, and a commitment to research-led improvement were presented as essential pillars for fortifying the Finnish education system.

This isn't the end; it's a new beginning. SCISSORS isn't just a project; it's a catalyst for continuous evolution. We envision an educational future where boundaries dissolve, and students become active co-creators of their learning journey. The integration of well-being, self-awareness, and interdisciplinary learning isn't a passing trend; it's an imperative for navigating the intricacies of the 21st century.

A Unified Call to Action

As we conclude this transformative journey, we extend a resounding call to educators, administrators, policymakers, and teachers worldwide. SCISSORS is not a mere theoretical construct; it is a clarion call for action, a blueprint for cultivating a vibrant and responsive education system. Whether you are a teacher fostering resilience and self-awareness, a policymaker envisioning a curriculum aligned with Sustainable Development Goals, or a school administrator contemplating innovation, SCISSORS beckons.

As we step into this new educational horizon, let SCISSORS be a guiding beacon, inspiring educators, policymakers, and learners to embrace a holistic, interconnected, and transformative approach to education. The future of learning is unfolding now, and the power to shape it lies in our collective hands.

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APPENDIX 1
Reconnection to nature through folk tales

A different way to talk about nature as a supplement to science education
By Dr Eva Virag Suhajda

A. Why do we need to approach nature from a different perspective?

There is a common misconception that science education, which involves teaching how nature works, is also a way to improve our relationship with it. "I know therefore I love" - some people believe, but this is not how emotions work. Our emotions are much more complex, and while scientific knowledge can increase ecological awareness, as well as love and attraction to nature, it does not for the majority of people. For most of us, it is not the what, but how we talk about something is what counts. A spider may be a beautiful and complex animal to a biologist, but most of us are still afraid of them. If we want to increase our awareness of nature and our inner self through our connection to natural phenomena, we should look to the humanities to see how nature can be viewed differently.

This "how" is assessed when we are working with narratives. Working with narratives in sustainability education has gone a long way. We are all surrounded by narratives. When we hear the word 'nature', several different memories, emotions and values are activated. These stories and emotions together make up narratives, which formulate the way we think about ourselves and about our environment, and indeed impacts the way we act and behave.

Existing narratives also formulate our inner narratives. When we listen to a story of another, watch a movie, listen to a poem or a song, the emotions it draws are good implicators how much they will have an impact on our internal narratives. Stories are coming from all different directions, most of us we cannot control. On the other hand as teachers or trainers, or coaches we still can control some of these, and also create a way to associate them with good feelings. That is why working with stories and storytelling has such a deep impact on individuals, and this is why it is very important to include it into education about nature.

However in this section we do not have enough space to discuss all literature supporting storytelling or working with narratives. According to our project's needs we are focusing on the special topic of narratives and relationship to nature, as well as the use of a special type of narratives – folk tales.

In this article we are exploring three topics: how language defines our relation to nature (and the way we think of it), how fairy and folk tales are used for narratives for ourselves and self-development, and how these two areas come together – why to use folk tales for supporting our connection to nature. Through folk tales we can connect nature and humans, soft skill development and ecological awareness building – and of course folktales can be a starting point to understand how does (and doesn't) nature works.

B. The way we talk about nature

It is common knowledge that the way we use language determines the way we think about something. Positive psychology uses this for changing our picture of ourselves and others – empowering us to talk more positively. Here we empower ourselves to talk more positively about nature.

Our relationship with nature, and within it with plants and animals, is also very much affected by the way we talk about it. Ecolinguistics targets this area with the concept of "re-minding", which according to Stibbe is "explicitly calling attention to the erasure of an important area of life in a particular text or discourse demanding that it be brought back into consideration" (Stibbe, 2015:164). In our case this is our relationship and relatedness to nature. The way re-minding can work is to give "salience" to these areas, giving them importance and reminding us of its value as an approach. Stibbe (among others) stresses that giving salience happens most successfully through visual description, relating something to our senses.

David Abram, philosopher, in his famous work The Spell of the Sensuous (1996) describes how we are very much bodily disconnected from nature, and how this reflects on our sense of self and our relationship with nature and our natural embeddedness. In his work, Becoming an Animal (2010) he argues that we need to find "a new way of speaking, one that enacts our interbeing with the earth (…) A style of speech that opens our senses to the sensuous" (Abram 2010:3).

How does salience work? How can we change our way of speaking about nature to have a deeper connection? As Stibbe (and Abram) points out, it is important to use sensual descriptions, also perhaps including emotional relationships (like awe, fear, love), which in turn give back the animal or plant its agency.

Let's consider 3 different descriptions about the same flower – evening primrose. This is a beautiful yellow flower, which opens up at sunset, blossoms through night, and withers by the morning. The three narratives are from three different texts: the first is a natural scientific description, the second is from an economical - scientific text, and the third is from a personal journal with a poem. Let's see what feelings arise while reading them.

1. Oenothera biennis, the common evening-primrose, is a species of flowering plant in the family Onagraceae, native to eastern and central North America, from Newfoundland west to Alberta, southeast to Florida, and southwest to

Texas, and widely naturalized elsewhere in temperate and subtropical regions. [3] Evening primrose oil (EPO) is produced from the plant. (…) Oenothera biennis has a life span of two years (biennial) growing to 1.6 m (5 ft 3 in) tall. [6] The leaves are lanceolate, 8–18 cm (3–7 in) long and 2–6 cm (3⁄4–2+1⁄4 in) wide,[6] produced in a tight rosette the first year, and spirally on a stem the second year. Blooming lasts from late spring to late summer. The flowers are hermaphrodite, produced on a tall spike and only last until the following noon (Oenothera biennis, Wikipedia).

2. Evening primrose originated in North America and became naturalised in the north-east of China about one hundred years ago, where it has been used as famine food and animal feed. New uses for the seed oil, which contains □-linolenic acid (GLA), that have been developed in China and overseas since 1980 have created a much larger commercial demand for the seed. There are eight species of Oenothera L. growing wild in China, of which Oenothera biennis L. is preferred. The maximum annual production of wild evening primrose seed is estimated to be about 3000 tons but, since 1986, evening primrose has also been cultivated for its seed and oil using O. biennis (primarily in the provinces of Jilin, Liaoning, Hebei, and Shandong) to meet the increasing demand. New production techniques have been developed and disseminated, and reported seed yields range from 750 to 3000 kg ha-1. Commercial production follows a cyclical pattern, with the largest harvest to date, in 1999, estimated at 16 000-19 000 tons of seed (Deng et al., 2001).

3. The little girl sat there in the orange sunset light, and waited for the evening primroses to open. “Look” –she screamed happily – “the bee climbed into the flower”. “Yes, she might look for a place for resting a little. She might be tired” – I responded. Meanwhile the flower popped up and started to open her beautiful yellow petals. It was like in an Attenborough movie – the whole blooming took less than a minute, the petals opened up, and the bee found herself outside again, with a big baggage of pollen sticking to her feet. At the very same moment, a withered petal – maybe from the flower of the previous night – slowly dropped to the ground. We all started the process with awe. I felt my throat tightening with a basic existential fear of loss.

Yellow buds pop up
Blossom for one night only
It is all we have.

(story and poem by the author)

These three snippets are talking about the same flower, however in a very different way which leads to very different emotions and relation to this plant.

According to cognitive theory (see Lakoff and colleagues on metaphors, 1980) our use of language is very much body-based – we formulate the meaning based on our embodied experience, which means that the more visually and sensually we describe something, the more emotions are invoked. We cannot really get attached to a plant which meets an increasing demand on production (description C); the same is likely to be true of a herb with a 'lanceolate leaves and hermaphrodite flowers' (B – although biologists might be an exception here); however pictures of a yellow flower in the sunset housing a bee and opening its petals quickly can invoke emotions. This flower has its own life and activities, it is an active being, an agent in itself,

Fairclough (2003:150) describes the process as impersonalization (here we apply this to plants - also active, living beings) where people (and other living beings) are represented only as elements of organisational structures and processes.

This impersonalization has an impact on how we connect to natural elements. We can clearly see this in the descriptions provided, but it is easy to find examples in our daily life, from our relationship to spiders through the apple tree in our grandma's garden which we climbed when we were children, to the plastic-covered chicken breast we buy in the supermarket. The further away we are from something, the more we think about it as an object or a resource, the less we are inclined to take real care of it. Science education has been strong since the last centuries, however it has also been a main driving force in all those developments, which are now endangering the natural environment. That is why it is important to complete it with a way of developing a deeper and personal connection to nature in order to develop a more holistic and sustainable way of thinking.

C. Folk Tales for supporting life narratives

In our approach to find a source which is a different, emotion-evoking narrative about nature, but also a source for self-development, we have turned towards folk tales, and folk tale work.

Folk tale therapy has long been a topic among psychologists; the well-known psychoanalyst Professor Dr. Verena Kast had already written a book about it in 1964 called "Folk tales as therapy". She is convinced that "Folk tales convey an attitude to life". She translates this strong statement with the explanation (Kast, 1995): "In Folk tales it sometimes goes quite strangely here and there, there are turns, which we do not consider possible, which we call then evenly "folk tale-like", or which we banish as too folk tale-like simply and simply into the area of the fantasy. With this we want to express that there is nothing to be done with it in the real, hard world: stories for dreamers. But can we be so sure? How would we be able to live if there was not always a hope that, against our better judgement, certain life situations can be overcome, that there are unexpected solutions in our lives, even unexpectedly good ones?"

Kast elaborates that almost all orally told fairy tales tell their listeners that problems are solvable, or we are capable of evolving in a way that certain problems are no longer a burden. Courage for the future, not getting stuck in the past and living in the moment is the motto of many Folk tales. (Kast, 1995)

So, in a therapeutic setting she believes, by listening to Folk tales and putting in his/her own imagination, people can always relate to the challenges and problems the protagonists usually face at the beginning of the story. Folk tales are stories everyone can easily imagine visually. In her belief thinking about Folk tales and the appearing symbols within it equals thinking about life and thinking about existential questions. But especially about us, but in the mirror of a folk tale, which makes it much easier than just sit there and start thinking about life in a conservative way.

Barbara Walker Baumgartner has a slightly different approach. In her publication called "Folktale storytelling as an educational tool, with possible therapeutic implications", she understands the telling of Folk tales more as an educational tool. She believes that fairy tales can be used in schools and other group settings to increase someone's self-awareness and self-esteem, as well as building a positive social growth through the excitement of the story. (Baumgartner, 1996)

She suggests that teachers, mental health professionals, and others can learn to be a storyteller by undergoing experiences that take them through the process of telling personal stories and retelling Folk tales. Furthermore, for this purpose, the 2nd part of their publication contains a storytelling workshop where more than a dozen activities are shown. "These activities: explore various aspects of oral communication; memory and visualisation as tools for story-learning; and the use of music and art expression as part of the storytelling experience." (Baumgartner, 1996)

Ildikó Boldizsar, Hungarian folklore researcher and folk tale therapist says that actually Folk tales reflect upon different kinds of situations people face, and even more: all situations (life situations and conflicts) have their relevant Folk tales: "Our ancestors still had a close connection with the symbol system of folklore and therefore when a storyteller chose a story, people did understand what it meant: what situation the story hero (protagonist) faced and how s/he solved it."

This way folk stories worked (and still can work) as threads to solve personal problems, as patterns to learn from about connections and problem solving.

Indeed, if we look at Folk tales and dig deeper inside them, we can experience this: there are stories about leaving the paternal house, stories of marriage problems, stories of conflicts between brothers and sisters, or parents and children, stories of friendships and so on. People in these stories do solve their problems somehow: they develop their personalities to become kings or queens of their lives, they kill dragons of their own bad customs and attitude and collect magical objects of their own competencies and skills. As the stories are not about dragons and magical wands – these are all stories of coping and connection, in which everything, every place, every person and being, every object is within our internal world.

In our Folk Tale boxes we primarily build on these aspects of fairy tales: how they can give us a hint about our own lives and our own development. In the boxes we included a guide for understanding of the tale, as well as a guide for self-work, counselling and group work (with children as well as with adults).

D. The relationship between nature and human in folk tales

Folk tales – the narratives of our ancestors – have long been giving directions to people about how to behave with each other. But folk tales (and other parts of folklore like rhymes and folk songs) also show a way how to look at the world around ourselves. In folk stories there is no alienation from Nature – actually other beings or imaginary beings are also as important – or even more important! - actors as humans. If we look at folk stories, we can see that people live in good peace with nature, because if they fail, they face severe consequences (dragons, storms, wreath of the sun or the sea).

Folk tales are therefore those narratives, which can help us to get a closer connection to nature, without analysing and assessing them, as we do in nature sciences. In our approach to work with folk tales – the folk tale boxes for self-learning, counselling and group self-knowledge development – we therefore chose fairy tales where natural actors have a large impact on the heroes' journey – as much as they have impact on ourselves in "real life".

In several tales change could not happen without nature. Through working with fairy tales on personal development, there is also this story – for change you need to be in a good relationship with nature. Which is in itself a very different narrative to scientific ones or even more to economic ones. That is why working with folk tales in sustainability education is such a strong tool.

In the SCISSORS method we have developed three folk tale boxes, from three tales representing all three partner countries: Poland, Finland and Hungary. These three tales are ideal for self-development (or personal development) work, but also shows a different, active side of nature. They can be used to counterpoint the science behind natural phenomena (folk tales do not describe the real phenomenon), and also to support thinking about them. Let's see how!

E. Scissors Folk Tale Boxes: Enhancing Nature and Science Education Awareness

Within the pages of this chapter, we unveil the intriguing concept of SCISSORS Folk Tale Boxes—an innovative approach poised to contribute significantly to the augmentation of nature awareness and science education. These narrative-laden containers encapsulate not only tales of cultural significance but also serve as potent tools to captivate learners and expand their understanding of the natural world. By integrating these story-filled repositories into educational settings, educators can unlock a realm where folklore intertwines seamlessly with scientific principles, fostering a profound appreciation for nature's intricacies. This chapter delves into the multifaceted potential of SCISSORS Folk Tale Boxes, illuminating their role in bridging cultural narratives and scientific knowledge, thus providing a compelling avenue for educators to enrich their teaching repertoire.

I. Little Yellow Snake (Hungary)

Once upon a time in a faraway land, even beyond the Glasshill and the seventh lands, there lived a poor man. This poor man had a beautiful wife, but no children not even one as big as a blow of tinder. They prayed for it in the evening as well as in the morning every time faithfully:
"Oh Lord, please give us a child even if it was only as big as a blow of tinder.
But God did not seem to listen to their prayers. Time passed by. Then one morning the woman woke up and said to her husband:
"What a foolish dream I saw this night."
"What did you see, tell me?"
"Well, a grey old man came to our house saying: "I know what you and your husband have as a problem. If you want to have a child, stand in front of the gate this morning, stop there, and whatever kind of animal comes there no matter how strange it looks, take it, bring it in, and it is going to be your child.'
"Well, you know, my lady,, it's quite a fool's dream, but let's try!"
They immediately got dressed, went out of the gate,
and stood there for quite a while.
Then all of a sudden, a little yellow snake crawled in front of them.
Hey, even if it's a snake, they caught it, the woman put it into her blouse, and they took it into the house, where they kept it well with bread dipped in milk.
Many days passed but at once the little yellow serpent
started to speak telling the poor an:
"Father, go to the king and ask his daughter's hand for me."
"What are you talking about, you unfortunate creature, for the king is about to cut my head if I dare so!"
"Just go, don't be afraid of anything, I'll take care of the rest."
(...)

How does it add to personal development through connection to nature?

In the Hungarian tale, Little Yellow Snake, the main protagonist himself lives in the skin of an animal:

- The parents are so much wanting a child, so they accept the yellow little snake as their child. In the long run, having no prejudices, proves them right.
- The hero, the yellow little snake has to take apples from the fairy's garden. The garden of fairies is like a garden of Eden, and apples several times have the meaning of knowledge and of knowledge of moral values.
- The tree in the garden is providing a space for protection for the snake against the dragon.
- And finally it turns out that the little yellow snake is not even a snake. Being a snake provides a possibility to be judged for his character instead of his outlook and parentage, however at the end this disguise is not needed anymore, and he has to be able to get rid of it.
- The snake's skin is burned in fire, a strong element which is a metaphor for radical change. The boy had to stand up as himself, and had to stay strong in order to become a king.
- But it's also a failure for his wife, who does not want to be judged by being wedded to a snake and designs the skin to be burned. That means she also have to reconsider and make steps for healing their relationship. She has to go out to nature and find her husband and make amends.

Folk tale elements to connect the tale with science education

- Geography: Hungary
- Physics: burning
- Biology: animals (dragons – reptiles, snakes, apples)

Altogether what we see in all three tales change could not happen without nature. Through working with fairy tales on personal development, there is also this story – for change you need to be in a good relationship with nature. Which is in itself a very different narrative to scientific ones or even more to economic ones. That is why working with folk tales in sustainability education is such a strong tool.

II. Bartus and the Duck (Poland)

It happened in the ancient, very ancient times. A time so long ago that no one remembers it well any more and all that is known is that only those things happened by then which are possible only in fairy tales.

In those great old times, there lived a very poor farmer called Bartuś in the mountains. He had a poor cottage, but nor he had farm buildings or livestock. He had just one saddled duck and that was all he possessed. He did not get much use out of this duck, because it did not lay eggs, but it followed him everywhere like a dog and quacked merrily. And Bartuś took care of her. Ho! Ho! He took great care of her - he would gather fresh grass for her, he would look for especially juicy leaves in the meadows, he would take her in his arms and carry her to the stream, so that she could swim in the crystal-clear water. This is how very caring Bartuś was.

So, because of this care for the duck, one day Bartuś went a little further away from home, to look for leaves and green watercress, which overgrew a small pond in a distant valley, with a glistening dark water. Bartuś took his backpack with him so that he could pick up the green watercress more easily, walking along the stony path and whistling merrily. Suddenly he stopped. Because it seemed to him that got some company. At first he thought it might be an echo. But when he listened closely, he realised that it was not an echo, but someone nearby whistling quietly and beautifully.
(...)

How does it add to personal development through connection to nature?

- In the Polish tale, Bartus and the Duck, nature and the elements of nature constitute the most important parts of the heroes' path:
- Love and connection: Bartus feels a strong connection and love towards his duck
- Motivation: this connection makes Bartus to go out and collect food for the duck, and ultimately, the threat against his favourite animal is the one that helps him to unlock his inner capabilities and become a king
- Learning and skills: the snake king (after being cared for) provides Bartus a set of skills which can be handy in his life (and indeed prove to be)
- Making a change: the elements of nature, above what the snake king provided control for Bartus helps him to protect himself, his duck, as well as making a change

Folk tale elements to connect the tale with science education

- Geography: Poland
- Biology: the snake, the duck
- Physics: the storm / natural elements

III. Girls Spinning on Ice (Finland)

Once upon a time there lived a man and a woman. They had a daughter. But death took the woman quite early. Soon the father married a second time, to the evil Süöjätär. Süöjätär gave birth to a child, who was also a girl. From that day on, the evil witch hated and persecuted her other stepdaughter.

The two girls grew up side by side, but Suöjätär tortured his stepdaughter because she was beautiful and charming, and her own daughter was filthy and ugly-looking. Winter came, and the lakes were shrouded in ice. Then Süöjätär cut a hole in the ice with a pickaxe at the shore and planted his daughters near her to spin. She gave his daughter real silk on her distaff, and for her stepdaughter she just put moss on the distaff. "Sit down here," - she said, "and spin nicely. But beware! Whoever rolls the distaff into the lake must go after it and look for it." The girls sat down and started spinning. Yes, but the beautiful girl's distaff suddenly detached and fell into the leak. Suöjätär, who just couldn't wait for this to happen, ordered her to bring it up from the water. The girl cried and cried not to dive into the frozen water of the lake as being so terrified of the ice-cold water. But she cried in vain. She had to obey Suöjätär's command. As there was nothing else left to do, she jumped into the icy water.

But as she plunged, a rarely beautiful wide path opened up before her. And the maiden began to make her way, but with such ease, almost flying, as if she had not been carried by her feet. After a while, she came to a house. But it couldn't be called a house, because it was too big for it, even though too small for a palace. She walked through the door and said 'Good day' loud and proud- . There was nobody else in the room but an old granny with a hooked chin. Granny asked her compassionately, "Who are you and how did you get here, my girl?" "I come from the upper world," replied the girl, describing how her distaff fell into the hole, how her stepmother ordered her to jump into the water in search of it. Then she asked the granny for work and food.
(...)

How does it add to personal development through connection to nature?

In the Finnish tale, Girls Spinning of Ice, it's also the elements of nature make a difference in the life of the good girl:

- The space for change: the girls have to go under the water, under the ice to be challenged and to change. In fairy tales, the space of the underground, which is always wild and natural, is often the space for deep personal change.
- The challenges: the girls have to clean and care for the cows, as well as for the lizards. In return, the animals provide feedback and recommendation on them 6ot he old women.
- The old women – a positive witch - herself leaves within and with together nature. Witches, old woman are usually depicted in fairy tales as not only being in close connection to nature, but also being able to 6ot he6i t. Here she is capable of talking to animals, as well as control the space and make a portal for the girls to go back 6ot he upper world.

- Promoting: and at the end it is the dog, who gives the news of the return of the girls to all the village. The dog is honest about the girls, even if it faces persecution from Süöjätär. It clearly states that the girls are rewarded with – treasure or tart.

Folk tale elements to connect the tale with science education

- Geography: Finland, weather in Finland, nature geography
- Physics: ice formation, water cycle
- Biology: animals (cows, lizards, dogs)

APPENDIX 2
Focus Group Interviews from Poland and Finland

In this chapter, we offer an analysis based on focus group interviews aimed at exploring the state of social competence development within science teaching and teacher training contexts across Poland and Finland. Our objective was to gather firsthand perspectives from in-service and pre-service science educators to better understand current practices and needs. Emphasis was placed on examining science teacher training methods and strategies for fostering self-awareness, soft skills, and other socio-emotional competencies.

A. Focus Group Interviews from Hungary

Digging deeper into the matter with stakeholders in Hungary

The Rogers Foundation organised focus group discussions and conducted four interviews involving individuals directly or indirectly associated with the younger generation and/or hard sciences during March 2023.

Focus Group 1: This recurring monthly assembly, comprising six to eight participants, featured scientists, teachers from both sciences and humanities, and various professionals. From this group, the majority of attendees were already acquainted with the SCISSORS project from prior meetings.

Focus Group 2: Convened specifically for this occasion in an online format, this group primarily consisted of practising teachers, who have not yet heard of the SCISSORS project or approach.

Online Interviews: Four interviews were conducted, involving six teachers from diverse areas and two financial experts—an experienced banker and an economist. The reflections and insights derived from these engagements have been carefully summarised and categorised into three distinct areas: 1. *personal experiences*, 2. *challenges & solutions*, 3. *disadvantages & benefits* of the SCISSORS programme.

I. Personal Experiences

This section delves into innovative teaching strategies, interdisciplinary collaborations, and motivational approaches, highlighting the interconnectedness of diverse fields and the nuanced dynamics between science, emotions, and human cognition in education.

We heard a story about a Math lesson. A trainee, when left unsupervised by the tutor, ingeniously incorporated linguistic concepts from her experience as a Hungarian language teacher to explain a mathematical idea. Kids understood the analogy. The success of this unorthodox method in conveying the concept to students underscored the potential of diverse teaching strategies, even if unconventional. In another instance, one of our participants shared experiences when constitutional lawyers reached out to the evolutionary biologist. They believed that he could assist them in crafting a more flexible constitution capable of addressing not only war but also other conflicts. They held the belief that evolutionary biology was capable of providing answers to overarching, complex questions.

Additionally, a teacher recounted the efforts of an ecology teacher's group at her school, emphasising their endeavours in energy conservation campaigns that yielded a remarkable 65% reduction in energy consumption. However, the teacher noted the necessity of years of conscientious ecology-awareness campaigns before witnessing active engagement from the students. A recurrent theme in our discussions centred around appealing to inherent goodness as a motivational tool. For example, here is the story: "I was walking to the school when in the garden I saw a kid discarding a chocolate wrapper. I simply told her: You know the lady who rakes the ground here in strips every day." So the kid took the paper and put it in her bag.

Drawing on the reflections of renowned individuals from Hungary intertwining science and human thinking, we recalled insights from psychologist László Mér□, who posited the role of emotions in mathematics. Physicist Tamás Vicsek's lecture on the collective movement of people and birds in panic offered further evidence of the interplay between scientific principles and human behaviour. Moreover, the insights of Vilmos Csányi, a renowned ethologist, led to reflection on the unclear status of ethology within the scientific community (i.e. not acknowledged as a science by researchers from other fields). These instances highlighted the complex interplay among science, emotions, and human cognition.

II. Challenges and Solutions

Introducing SCISSORS into the current Hungarian educational system poses several challenges, primarily rooted in three key factors. Firstly, the National Curriculum, characterised by its overarching principles, diverges significantly from the conceptual foundations of SCISSORS. Secondly, the project-based learning approach inherent in SCISSORS challenges the conventional understanding of the scientific method for investigation and learning. Lastly, the distinct cognitive processes associated with humanistic and scientific thinking contribute to the complexities surrounding the incorporation of SCISSORS into the educational framework.

Differences between Science and Humanities

One of the most significant challenges in integrating SCISSORS into the Hungarian educational system stems from innate distinctions in the nature of science and humanities, which leads to different ways of thinking among teachers from these disciplines. Physics and Chemistry, for example, rely on precise measurements and

controlled experiments, where simplification and the exclusion of certain parameters help to produce replicable results. Traditional scientific education emphasises exclusive thinking, focusing on specific areas of interest, whereas intuition typically plays a minor role.

In contrast, human sciences necessitate an inclusive approach in which all factors are considered and the unpredictability of human elements is acknowledged. Because of the numerous unpredictable human factors, social science experiments rarely produce consistent results. The distinction between exclusive and inclusive thinking extends to the differences between artists and scientists, prompting the exploration of how to balance both dimensions within an individual.

Encouraging a synthesis of thinking styles is especially beneficial, as evidenced by the potential for personal growth that can occur when combining the social-oriented and experimental approaches of humanities and arts teachers with the more exclusive and structured methods of science educators. This shift entails transitioning from a teacher-centric to a student-centred approach that promotes collaboration and exploration. Given that people tend to gravitate toward teaching paths that match their personality types, the challenge is to promote a holistic perspective. SCISSORS allows both teachers and students to develop the ability to think exclusively and inclusively, recognising the constant oscillation between the two perspectives. Finally, the learning process entails mastering the art of clever simplification within a comprehensive educational framework.

Environmental studies

Our exploration into environmental studies revealed the complexity of addressing issues beyond individual short-term needs, particularly in the context of the climate crisis and associated anxieties. The challenge lies in overcoming the prevailing sense of powerlessness among young people who feel inundated with information, leading to an "just leave me alone" attitude. To instigate change, we emphasised the need for authentic information communicated through carefully chosen channels and unconventional methods. Mindfulness emerged as a crucial aspect often overlooked, underscoring the importance of appreciating natural elements like health. Raising awareness about indirect benefits and combating air pollution, for instance, requires a shift in perspective.

In our discussions, we identified collective programmes fostering positive motivation and actionable steps for the environment. Examples included taking stairs for health and energy savings or organising sewing circle campaigns to reduce paper towel usage. Participatory environmental education emerged as a powerful tool, empowering young people to make decisions and take responsibility for environmental protection.

Understanding the complexity of environmental protection, which intertwines social and natural aspects, is vital. The intricate network theory in environmental science requires a multifaceted approach, and simplification may lead to uncertainty. The focus extends beyond environmental concerns to shaping a cultural understanding of behaviour and scientific knowledge for human protection and survival. Local

issues were recognized for their global impact, echoing the notion that small actions contribute significantly to environmental well-being. However, field trips, particularly to forest schools, were discussed, reflecting the power of experiencing the world holistically rather than acquiring expertise.

Environmental disasters and sustainability emerged as transitional topics, necessitating collaboration between scientists and social experts to find effective solutions. Additionally, our discussions delved into the challenge of countering the manipulative consumer marketing machine. While some marketing experts experiment with selling environmental protection as a product, our group acknowledged the uphill battle in changing consumer behaviours and desires.

Challenges schools face

Young people often exhibit selectivity in choosing classes, particularly at the university level, due to the overwhelming nature of their academic workload. Many students feel inundated with work, making it challenging to keep up with the demands of their studies. Consequently, some may choose to forego attending classes in which they lack interest, despite potential consequences. The SCISSORS project presents an innovative approach that has the potential to capture students' interest and engagement in science-related subjects.

In Hungary, the existing system requires teachers with a few teaching hours at a school to travel to other schools within the region. The SCISSORS project introduces a novel dimension by enabling a "driving" science teacher to teach various subjects, potentially reducing the need for extensive travel between different schools. This approach not only streamlines the logistics for teachers but also opens up possibilities for interdisciplinary learning experiences, fostering a more engaging and adaptable educational environment for both teachers and students.

III. Disadvantages

One notable drawback we identified in the SCISSORS programme is the increased time investment and the need to acquire new preparation methods for lessons. Unlike the conventional approach of simply referring to a specific page in a textbook, the SCISSORS programme demands a more intricate and **time-consuming preparation** process. This shift poses a potential challenge for educators accustomed to more traditional teaching methods, highlighting the need for additional training and adaptation to the innovative aspects of the SCISSORS programme.

IV. Benefits of the Programme

The SCISSORS project emerges as a transformative tool capable of enhancing teacher fulfilment and mitigating feelings of alienation. Serving as a preventive measure against burnout, the program disrupts routines, demystifies sciences, and furnishes teachers with a structured methodology to comprehend the intricate aspects of human functioning. Encouraging an acceptance of our connection to

nature and the world, SCISSORS fosters creativity, insight, and multiple perspectives, prompting teachers to undergo personal change.
In the SCISSORS project, teachers and students collaborate as equal partners, fostering intra- and interpersonal knowledge that proves invaluable for educators seeking to expand their skills and create a positive learning environment. In Hungary, where there is a decline in teacher trainees in science, the human-centric approach of SCISSORS may attract more young teachers interested in teaching science, potentially alleviating the shortage of science teachers and involving educators from the humanities.

The program prompts consideration of when to introduce complexity in subjects and when to teach them as separate disciplines. It advocates for an integrated approach at the primary level, gradually transitioning to separate subjects in high school, and finally establishing connections among them in later grades. SCISSORS imparts a valuable lesson in existing with uncertainty, emphasising the ability to react effectively when faced with the unknown. Collaboration is underscored as the key to progress in scientific research, acknowledging the vastness of scientific knowledge and the necessity for collective efforts across different fields.
In the contemporary world, characterised by a constant flux of information through the internet, the demand for complex knowledge is evident. Adapting to this dynamic environment and leveraging the internet's potential becomes essential, aligning with the UN's 17 Sustainable Development Goals and UNESCO's Pedagogical Complement on Key competencies. This adaptability, coupled with an acceptance of uncertainty, is posited as a source of security in navigating the challenges of an uncertain macro-environment.

B. Focus Group Interviews from Poland

Invitations were extended to individuals directly involved with young people in their professional roles, those presently working within educational institutions, or those aspiring to pursue teaching careers. All participants shared a common perspective, emphasising the crucial importance of soft competencies, placing them on an equal footing with scientific knowledge. There was unanimous acknowledgment among participants regarding the necessity of interdisciplinary collaboration in contemporary educational settings. The project, along with its foundational assumptions, was meticulously presented to all attendees. The presentation drew upon the insights of the US educator, Rita Pierson, underlining her proposition that each child requires a mentor and that positive teacher-student relationships are fundamental for effective knowledge acquisition.

The focus group, organised during March 2023, comprised diverse stakeholders with backgrounds spanning psychology, chemistry, mathematics, computer science, Polish language, history, and art. This group included educators, researchers, and future teachers, all sharing a common interest in interdisciplinary approaches to teaching, combining science with various art forms, and fostering holistic education.

The plenary discussion unfolded with lively engagement as participants enthusiastically shared experiences and aspirations for an interdisciplinary educational approach. Addressing four pivotal questions—identifying weaknesses, recognizing benefits, proposing potential solutions, and acknowledging obstacles—the stakeholders provided a comprehensive overview of their perspectives. This dynamic exchange reflected a collective desire to navigate challenges and leverage opportunities for the successful integration of interdisciplinary methods in Polish schools.

I. Limitations of the Polish Education System for SCISSORS Integration

Several limitations become apparent upon examining the current educational system in Poland. Parental attitudes, wielding considerable influence over a child's education, may not consistently align with fostering an optimal learning environment. A narrow worldview could constrain a child's perspective, impeding their holistic development. The efficacy of teaching materials for students facing learning difficulties may be compromised, impacting their ability to grasp content. Time constraints within the educational framework may curtail the depth and breadth of learning experiences.

Moreover, misunderstandings among parents regarding their child's educational needs may result in unmet requirements. High material costs could serve as a barrier to accessing quality education, with no assurance of positive outcomes. The excessive freedom within the curriculum might lead to a lack of structural guidance, while the fear of deviating from the core curriculum could limit creative teaching approaches.

The absence of class notes may hinder students' independent learning, and apprehensions related to exam preparation could contribute to student anxiety. Additionally, an overly broad program may not adequately cover essential concepts and skills. These identified weaknesses underscore critical considerations when evaluating the effectiveness of educational systems and practices.

II. Benefits of interdisciplinary approach

The participants highlighted several notable benefits associated with the proposed educational approach. First and foremost, it fosters creativity and personal development in students, serving as a platform for self-expression and the cultivation of individual talents. Moreover, this approach promotes a strong sense of connection between teachers and students, contributing to a more intimate and effective learning environment. Exposure to diverse ways of thinking encourages open-mindedness and fosters an environment where failure and mistakes are accepted as integral parts of the learning process.

The exchange and sharing of skills among students contribute to an enriched overall knowledge base, while the absence of comparison reduces unhealthy competition,

fostering a more collaborative atmosphere. With more time dedicated to education and intrinsic motivation, students can engage in deeper and more meaningful learning experiences. Additionally, this approach aids in the development of social skills, particularly cooperation, and provides students with a sense of freedom and movement, enabling them to explore their interests and express themselves. These advantages underscore the value of an education system prioritising holistic development and individual growth.

III. Challenges and Obstacles

The education system faces a multitude of obstacles and challenges. These include the reluctance of students to invest time in subjects they believe won't lead to well-paying jobs, dealing with children's disorders and dysfunctions, the lack of enthusiasm among teachers, and the pressing issues of teacher shortages and professional burnout. Moreover, there is a sense of inadequacy in artistic skills, bureaucratic administrative hurdles, and the prevalent parental preference for science subjects over arts. Other hurdles include shortcomings in teacher training, budget constraints in schools, difficulties in creating workable schedules, inadequate teacher preparation, time limitations, overcrowded classrooms, high expectations without immediate results, and the reliance on fear and hierarchy to establish authority. The misconception that teachers should focus solely on teaching, the projection of adult expectations on students, and teachers' apprehensions about adopting innovative approaches add to the educational challenges. Addressing these issues is vital to enhance the effectiveness of the education system.

IV. Solutions for Removing Obstacles

Several potential solutions can be considered. These solutions include the idea of implementing reforms gradually to ensure a smooth transition and adaptability to changing needs. An approach that looks to the future and is forward-thinking is crucial for educational development. It might involve reevaluating the traditional examination system and opting for alternative assessment methods, such as project-based evaluations or continuous assessment. Shifting the focus from covering the entire core curriculum to achieving specific milestones aligned with essential learning outcomes can help tailor education to individual needs. Flexibility can be introduced by abolishing rigid timetables, and promoting inclusivity and diversity by moving away from stereotypes. A shift in teacher accountability recognizes that educators cannot be held responsible for all aspects of a student's performance, and difficulties should be seen as challenges for growth. Removing school bells can create a less regimented learning environment, and adapting the core curriculum to students' unique needs is essential. Adjusting class durations, incorporating play-based learning, inspiring and informing parents, implementing project-based teaching, providing teachers with updated training, and personalising the core curriculum all contribute to a more holistic and flexible educational system aimed at overcoming obstacles and catering to the diverse needs of students.

V. Conclusion

The obstacles to implementing an innovative, interdisciplinary educational approach can be categorised into three groups. Internally, individual personality traits, including passions, fears, and disorders, pose challenges, as does the projection of parents' fears onto their children. Externally, obstacles involve parental demands, the lack of coherence between parents and schools, communication issues, and time constraints. Bureaucratic hurdles encompass financial constraints, inadequate teacher training, low teacher salaries, administrative bureaucracy, and insufficient support for an adequate number of teachers and psychologists in schools.

Weaknesses in the current system include broad programs, lack of exam preparation, lack of understanding, difficulty in structuring education, absence of outcome guarantees, and a lack of confidence among parents. Children may face issues such as unclear feedback and feeling lost, especially those with dysfunctions. Teachers may experience disillusionment, burnout, and difficulties in interdisciplinary education and communication, as well as the assumption that the entire core curriculum must be met.

Positive aspects can be categorised into four domains: physical, internal, future-oriented, and educational benefits. These include the establishment of neural connections, promotion of freedom and movement, prevention of misunderstandings, and enhancement of social skills. Other benefits encompass heightened tolerance for mistakes, fostering intrinsic motivation, development of empathy, cultivation of talent, stimulation of creativity, facilitation of self-expression, broadening of horizons, and the promotion of a holistic approach to learning.

To overcome these obstacles and create a more innovative and holistic educational system, several potential solutions are proposed. These include building a vision of the "new teacher" by modifying academic teaching content, providing greater support for teachers, conducting university-level workshops, promoting the best students, and selecting candidates for pedagogical studies more rigorously. Changes in societal attitudes towards education and teachers are necessary, focusing on global teaching and promoting skills over encyclopaedic knowledge. These changes require comprehensive reforms within the education system.

Feasible strategies involve the phased incorporation of proven international models, commencing with the project method and promoting collaboration among teachers across disciplines. Informing and inspiring both parents and the general public, adopting a flexible core curriculum, and challenging prevailing stereotypes are integral components. The overall inference indicates a viable space for interdisciplinary education within Polish schools, potentially through the comprehensive adoption of initiatives like the SCISSORS project, engaging the entire school community, including parents, caregivers, and educators.

Appendix 3
Impact Survey

Impact Survey Results

The Impact Survey, conducted in both Hungary and Poland, served as a crucial tool in comprehensively assessing the SCISSORS project's influence on various educational stakeholders. Aimed at educators, principals, policymakers, and other participants involved in the project, the survey sought to capture nuanced insights into their experiences and perceptions. Utilising a 5-point Likert scale, the survey covered essential aspects such as interdisciplinary appreciation, the value of merging sciences and humanities, creative inspiration, the utility of the theoretical background, and the project's impact on teaching methodologies. The surveys were facilitated through Google Forms, translated into local languages to facilitate data collection, and participants were encouraged to provide additional comments and suggestions for qualitative depth. The deadline for survey completion was 5 December 2023, and all participant responses were treated with the utmost confidentiality. The subsequent analysis of survey results provided valuable insights into the transformative potential of the SCISSORS project within educational settings.

I. Hungary

The analysis of information from Hungarian stakeholders yields insightful observations about the SCISSORS project. Among the 15 colleagues who participated in the survey, 6 had prior experience with projects aligned with the SCISSORS thought, while the remaining 9 were recently introduced to it. The majority of participants are practising teachers, with 1 having transitioned to theoretical fields after teaching, and 5 consistently pursuing the theoretical track.

Questions asked participants about the level of agreement with Scissors goals and of the usefulness of the training. Out of the 15 participants, two colleagues indicated that they didn't find the discussions very useful, the rest were satisfied with the help they got in understanding the idea. Even the person who found the training less valuable found the idea inspiring. Analysing specific questions, 4 participants mentioned that the focus group discussion contributed minimally to their personal teaching practice (question 11), while 1 reported no contribution at all. However, one-third of respondents indicated a significant positive impact.

Regarding the program's influence on the educational system (question 14), 4 participants were sceptical, four were certain of its impact, and seven were open to the possibility. Three individuals remained neutral about the program's inspirational force, while seven appreciated its motivational impact. Concerning the usefulness of the program for curriculum development (question 5), only three participants did not find it valuable. Similarly, three respondents perceived minimal impact on their

teaching methodology (question 12), whereas seven believed the program could enhance curriculum writing.

Teachers unanimously agreed that the program significantly contributes to students' personal development, earning it a score of 73 out of a possible 75 points (question 2). High appreciation was also observed for connecting social aspects to science (question 2), the program's impact on curriculum development (question 4), and its influence on critical thinking (question 7). In conclusion, the overall sentiment from the focus group discussion suggests that teachers find the SCISSORS program relevant and impactful on various educational aspects.

II. Poland

Feedback from participants in the SCISSORS project reveals a markedly positive impact on their educational perspectives and practices, particularly in embracing interdisciplinary knowledge. An overwhelming 81.8% of participants express deep appreciation for the project's emphasis on interdisciplinary learning. The value of merging sciences and humanities is widely recognized, with 90.9% acknowledging its significance, showcasing a unanimous commitment to the importance of interdisciplinary education.

The survey results also shed light on the inspirational and critical thinking aspects of the project. A significant majority, 72.7%, find the information creatively inspiring, highlighting the project's role in fostering critical thinking skills within an interdisciplinary framework. Moreover, 54.5% of participants view the theoretical background provided by SCISSORS as valuable in comprehending a novel curriculum.

Beyond theoretical appreciation, participants recognize the practical utility of the project. A substantial 54.5% see the information as a valuable resource for curriculum development, while a similar percentage (72.7%) reports a positive influence on their teaching methods. The positive impact extends to the project's toolkit, with 63.6% expressing expectations that it will facilitate the seamless integration of SCISSORS methodology into their teaching practices.

Importantly, participants believe in the broader goals of the SCISSORS project. Over half (54.5%) consider aiding students in understanding themselves and their environment better as a crucial objective. Moreover, the positive influence extends beyond individual experiences, with 90.9% recognizing the benefits of the project's Focus Group for professional development. The feedback encompasses not only quantitative ratings but also qualitative insights. Participants share comments and suggestions, emphasising the transformative nature of the project, expressing concerns about its implementation in Polish public schools, expressing satisfaction with focus group participation, and advocating for increased interdisciplinary approaches in Polish schools.

In summary, the collective feedback reflects a positive consensus on the transformative impact of the SCISSORS project. This underscores its potential not only to reshape individual teaching practices but also to foster broader

systemic changes in educational approaches, promoting a more interdisciplinary perspective in teaching. As the surveys were conducted in Hungary and Poland, the diverse responses from these regions enrich the findings, contributing to a more comprehensive understanding of the project's impact across varied educational contexts.

III. Impact Survey Questionnaire

Thank you for participating in this survey.

Your feedback is crucial for assessing the impact of the SCISSORS project on teachers, principals, educational policymakers, and other educational stakeholders. This survey should take approximately 10-15 minutes to complete.
All responses will be kept confidential.

Please rate the following statements based
on a 5-point Likert scale:

1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

Deadline for filling out the survey is 20 november, 2023

1. The information I received during the SCISSORS project has helped me appreciate the interdisciplinary nature of knowledge./Informacje, które otrzymałem podczas projektu SCISSORS pomogły mi docenić interdyscyplinarny charakter wiedzy.
2. I now see the value in merging sciences and humanities in educational settings./Teraz widzę wartość w łączeniu nauk ścisłych i humanistycznych w środowisku edukacyjnym.
3. The information I received during the SCISSORS project has creatively inspired me and reminded me the importance of critical thinking skills in an interdisciplinary context./Informacje, które otrzymałem podczas projektu SCISSORS, twórczo mnie zainspirowały i przypomniały mi, jak ważne są umiejętności krytycznego myślenia w kontekście interdyscyplinarnym.
4. The theoretical background provided by the SCISSORS project has been valuable in understanding a new type of curriculum./Teoretyczne podstawy zapewnione przez projekt SCISSORS były cenne w zrozumieniu nowego rodzaju programu nauczania.
5. The information I received about the project is a useful resource for curriculum development./Informacje, które otrzymałem na temat projektu, są przydatnym źródłem do opracowania programu nauczania.

6. The information I received **about** the project has positively influenced my attitude towards teaching sciences and other subjects./Informacje, które otrzymałem na temat projektu, pozytywnie wpłynęły na moje podejście do nauczania przedmiotów ścisłych i innych.
7. I expect that the toolbox to be provided will be a useful resource in incorporating the SCISSORS methodology into my teaching./Oczekuję, że dostarczony zestaw narzędzi będzie przydatnym zasobem we włączaniu metodologii SCISSORS do mojego nauczania.
8. I believe it is an important goal of the SCISSORS project to aid students in understanding themselves and their environment better./Uważam, że ważnym celem projektu SCISSORS jest pomoc uczniom w lepszym zrozumieniu siebie i swojego otoczenia.
9. The Focus Group by the project have been beneficial for my professional development./Grupa fokusowa w ramach projektu była korzystna dla mojego rozwoju zawodowego.
10. The information I received about the SCISSORS project has had a positive impact on my teaching methods./Informacje, które otrzymałem na temat projektu SCISSORS miały pozytywny wpływ na moje metody nauczania.
11. I would recommend the SCISSORS approach to other educators and policymakers./Polecam podejście SCISSORS innym nauczycielom i decydentom.
12. The project has the potential to bring about significant changes in our educational systems./Projekt ma potencjał do wprowadzenia znaczących zmian w naszych systemach edukacyjnych.
13. Please provide any additional comments or suggestions regarding the SCISSORS project./Prosimy o wszelkie dodatkowe uwagi lub sugestie dotyczące projektu SCISSORS- only in english