INTERNATIONAL EXPERT SEMINAR:

EXPANDING THE FOCUS OF RESEARCH IN SCIENCE EDUCATION: NEW TRENDS AND BEST PRACTICES

6 March 2024 Estonian Academy of Sciences Tallinn, Estonia





The seminar is supported by Horizon 2020 Twinning project "Addressing Attractiveness of Science Career Awareness" (SciCar)

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Compiled by Miia Rannikmäe Edited by Kerlin Remmel and Terje Tuisk Designed by Kaspar Ehlvest Background photos by Reti Kokk

FOREWORD

Major challenges face today's world. There is a need for a new generation of researchers and practitioners who can identify and solve major chalenges, such as – meeting energy needs, the availability of clean water, addressing climate change, food availability, health concerns and transport related issues. The educational sector, in particular science education, has a prominent role in supporting the ambitions of resolving these challenging issues. Even more, in meeting relevance needs of a science provision during adolescence years, it becomes essential for science education to embrace sustainability issues, develop students' interests, and promote a strong motivation to learn.

The challenge facing science education research lies in advancing and embracing new trends and best practices. This serves as a pathway, leading not only to advancements in the quality of teacher education programmes, but also to better-prepared students for a scientifically literate and innovative society, able to adapt to changing societal and career challenges, meaningful use of technological and digital literacy and greater awareness of 'science for careers in an advancing society'.

Assuming the intended actions promote achievement of research excellence, this needs to be closely integrated with education. By committing to research-based approaches in preparing and empowering new generations of capable, competent educators, the current expert seminar seeks to pay attention to – the importance of alignment of educational choices with science careers, building desired science learning over time and the sharing of best practices from Finland, Israel and Estonia, gained through the life of the Horizon 2020 project SciCar. The benefits of the international partnership, for the leading scientific institutions, are seen as 3-fold (all within an overall key target to promote interest and career awareness):

- Producing evidence of impacts of science education approaches on attracting young people towards science studies and sciencerelated careers.
- Assuring tangible outcomes for use by researchers, teachers, teacher educators and policy makers for future educational planning.
- Including research studies on the impact of context-based approaches in schools, or out-of- school education, supporting science education, in context, through digital tools and assessment.

These aspects are intended to be the focus of discussions during the panel session.

Miia Rannikmäe, Professor of Tartu University Coordinator of SciCar project Chair of the Seminar: Prof. Miia Rannikmäe

10:00–10:30 Arrival. Welcome coffee

10:30–11:15 Opening remarks.

Prof. Jaak Järv, Secretary General, Estonian Academy of Sciences Prof. Jakob Kübarsepp, Head of The Education Committee of the Estonian Academy of Sciences Dr. Aune Valk, vice-rector for academic affairs, University of Tartu Dr. Leho Ainsaar, Dean of the Faculty of Science and Technology, University of Tartu Prof. Katrin Niglas, vice-rector for research, University of Tallinn Prof. Miia Rannikmäe, Coordinator of SciCar project, University of Tartu The Importance of Alignment for Educational Choices 11:15-12:15 and Science Careers. Prof. Barbara Schneider, Michigan State University 12:15-12:45 Science Career awareness. Dr. Elisa Vilhunen, University of Helsinki 12:45-13:30 Lunch Building Useable Knolwedge Over Time. 13:30-14:30 Prof. Joseph Kracjik, Michigan State University 14:30-15:00 Meaningful use of technology to achieve science competence. Prof. Margus Pedaste, University of Tartu, Committee of Education Estonian Academy of Sciences 15:00-15:10 Short break 15:10-16:10 Panel discussion: Lessons learnt from SciCar project. Prof. Jari Lavonen, University of Helsinki, Dr. Rachel Mamlok Naamann, Weizmann Institute of Science, Dr. Heili Kasuk, University of Tartu,

MSc Rauno Neito, University of Tartu

Moderator: Prof. Jack Holbrook, University of Tartu

- 16:15–16:45 Concluding remarks. Prof. Jack Holbrook, University of Tartu
- 16:45–17:15 Reception



A BRIEF BIOGRAPHY OF THE PRESENTERS AND ABSTRACTS

Tartu University Head of the SciCar project Chair of the seminar



Miia Rannikmäe is a Professor of Science Education at the Institute of Ecology and Earth Sciences within the Science and Technology Faculty at the University of Tartu. She has considerable experience in science education in Estonia, Europe, and worldwide, including being a Fulbright Fellow at the University of Iowa, USA. With a background in school teaching, she has significant experience in in-service teacher education. Rannikmäe has served as a member of a European Commission high-level expert group tasked with publishing a report on "Europe Needs More Scientists" and has been responsible for multiple research grants funded by EC. She has also served as a secretary for the International Council of Associations for Science Education (ICASE) and is currently a member of the executive Committee, chairing a standing committee for university liaison. Since 2017 she has been the chair of Estonian national project developing e-testing in science at III and IV school levels. She is a certified professional coach, accredited by Erickson Coaching International.



Secretary General, Estonian Academy of Sciences

PROF. JAAK JÄRV

Professor Jaak Järv holds a PhD in organic chemistry and is Doctor of Chemical Sciences (Dsc in physical biochemistry). He is Professor of Organic Chemistry at the University of Tartu; Doctor Honoris Causa, Kuopio University, Finland; Medical Doctor Honoris Causa, Uppsala University, Sweden. Prof. Järv's main research interests are focused on the design and synthesis of bioactive compounds and investigation into the molecular mechanism of their action. An accompanying interest is chemistry education, related to the development of the learning environment and teaching tools by using computers and information technology.

Estonian Academy of Sciences and Science education

The Estonian Academy of Sciences is closely involved in the development of science and innovation in the country. Therefore, we also follow the problems related to science education, especially those that are the focus of this seminar. Not surprisingly, it can be concluded that the interest of students in understanding our world and studying science can grow but can also fade at school. The choice between these possible paths is probably determined by the learning environment, but also by the attitude that surrounds the student at school.

Head of the Committee of Education, Estonian Academy of Sciences

Professor Jakob Kübarsepp holds a PhD in materials engineering. He was Professor of Tallinn University of Technology in 1992–2021. Since 2021



he is Professor Emeritus and Senior Research Scientist. His main research interests are focused on powder metallurgy of wear resistant composite materials, in particular cermets, engineering ceramics, and tribology. In administrative positions related to education, Jakob Kübarsepp served as Dean of the Faculty of Mechanical Engineering (1994–2000) and Vice Rector for Academic Affairs (2000–2011 and 2014–2017) at Tallinn University of Technology. Since 2022 he is Chairman of the Education Committee of the Estonian Academy of Sciences.

The Education Committee of the Estonian Academy of Sciences

The Estonian Academy of Sciences provides scientists and their partners with a cooperation platform, contributing to solving social and economic development issues facing the country. The Academy emphasises the necessity of being present at different levels of society, including providing scientific advice and science-based recommendations to the government on key issues of Estonian science, education, economy, and culture. Different committees coordinate the Academy's initiatives, for example in the fields of energy, marine sciences, cyber security, etc. The Education Committee was launched in 2022. The Committee deals with issues related to the shaping of national education policy, which includes responding to reports on education and schools, organising relevant conferences and symposiums in partnership with universities. In the field of schools, the Committee promotes science-based education, with a primary focus on mathematics, natural sciences, and technology, as well as teacher training.



Vice-rector for academic affairs, University of Tartu

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Aune Valk holds a PhD in Psychology and currently serves as the vice-rector for academic affairs at the University of Tartu, Estonia. From 2008 to 2014 she held the position of Estonian national project manager for OECD survey of adult skills – PIAAC. Between 2014 and 2018 she led the analyses department at the Ministry of Education and Research, providing educational and research-policy making with data, statistics, and studies. Her previous roles include working as a researcher in various institutions and serving as the director of Open University – the brand for adult education at the University of Tartu. She has authored numerous publications on cross-cultural psychology and education.

The lack of STEM teachers in Estonian schools is one of the greatest challenges for the entire educational system. The University of Tartu is directly involved since it is on the one hand responsible for teacher training and, on the other hand, relies on the competence of its student candidates – the graduates of schools with varying levels of STEM teaching quality.

The SciCar project is thus of utmost importance since it aims to enhance science education expertise both among researchers and educators and creates a centre of excellence at the University of Tartu. This centre will engage with STEM teacher education bodies, science centres, and science teacher associations. Its key objectives include bridging the gap between scientists and science educators, making teaching more attractive, and increasing the number of STEM-trained teachers.

Dean of the Faculty of Science and Technology, University of Tartu



Leho Ainsaar is a professor of Geology in the Faculty of Science and Technology at the University of Tartu and since 2020 Dean of the same faculty. Staff within the Faculty of Science and Technology is responsible for programs promoting STEM teachers education. He has PhD in Geology from the same University. As a professor of Geology, his research is ongoing in the Institute of Ecology and Earth Sciences, he is an actively publishing researcher and supervisor of Master and Doctoral students with the specification in Carbonate sedimentology, geochemistry and stratigraphy and Basin analysis.



Vice-rector for research, University of Tallinn

Prof Katrin Niglas has a PhD in Educational Sciences from Tallinn University and a MPhil from the University of Cambridge. She initially

graduated as a Mathematics and Informatics teacher. Currently, Niglas serves as the Vice-Rector for Research at Tallinn University. She is an internationally recognized expert in mixed methods research and an active editorial board member of the Journal of Mixed Methods Research as well as the International Journal of Multiple Research Approaches. She has been involved in numerous research projects across education, social sciences, and humanities as an expert in methodology and data analysis. Professor Niglas possesses extensive experience in collaboration with international academic colleagues.

Science Education in Tallinn University

Tallinn University recognizes the importance of teacher education, particularly in the field of science. Our university is dedicated to equipping educators with the necessary tools, knowledge, and skills to inspire and empower students in their studies. We understand that the quality of science education relies heavily on the expertise and dedication of teachers. Therefore, investing in science teacher education is crucial, also for rising school and University students interest in STEM subjects. At Tallinn University, we prioritize the professional development of science teachers through research-based teaching approaches and collaborative initiatives. Our national and international networks and partnerships enables us to stay at the forefront of innovative teaching methodologies and best practices in science education.We extend our gratitude to Professor Miia Rannikmäe and the SciCar project for their leadership and dedication to advancing science education. Together, let us continue to innovate and inspire the next generation of STEM leaders. At Tallinn University, we are proud to highlight the exceptional collaboration between our institution and the University of Tartu, particularly in the field of educational sciences. In conclusion, Tallinn University is dedicated to foster excellence in science teacher education. Together with Tartu University we are responsible for the education of Estonian Science teachers for the future.

Michigan State University



Barbara Schneider holds the John A. Hannah Chair and is a University Distinguished Professor in the College of Education and the Department of Sociology at Michigan State University. Her research focuses on how the social contexts of schools and families influence the academic and social well-being of adolescents into adulthood. Schneider has also designed tools and research methods for measuring real-time everyday experiences that advance learning. She is a Fellow of the American Association for the Advancement of Science, the National Academy of Education, the American Educational Research Association, and the Finnish Academy of Science and Letters. She holds an Honorary Doctor of Philosophy degree from the University of Helsinki. Professor Schneider has published over 150 articles and reports and written 20 books including "Trust in Schools: A Core Resource for Improvement", "The Ambitious Generation: America's Teenagers Motivated but Directionless", and "Learning Science: The Value of Crafting Engagement in Science Environments".

The Importance of Alignment for Education Choices and Science Careers

During adolescence, most young people seek independence, try out different roles and identities, and imagine future jobs for themselves. However, many of them are unrealistic about the type of jobs they expect to have as adults, as well as the education, skills, or self-awareness needed to achieve these goals. Young people who have a clear understanding of the types of jobs, they aspire to, and how much education they need to attain these positions, have what has been termed as having "aligned ambitions." These young people are more likely to develop a realistic strategy aligning their educational expectations with their career interests, though not necessarily tied to a specific occupation. Exposing students to science project-based meaningful experiences can strengthen some science career ambitions and cultivate interest and direction in others who may not have considered these topics for their future careers. This presentation describes research on alignment and its value and importance for adolescent exposure, especially for gender and minoritized populations.



University of Helsinki

Elisa Vilhunen works as a postdoctoral researcher on the research project "Learning of the competencies of effective climate change mitigation and adaptation in the education system" in the Faculty of Educational Sciences at the University of Helsinki. She is also a visiting researcher at Aalto University in

Espoo. Her main research interests lie at the intersection of science education and educational psychology. Currently, her research focuses on student engagement and emotions in climate education. Elisa Vilhunen has a background in secondary education as a science teacher and as a school counsellor.

Understanding the Factors Influencing Upper Secondary School Students STEM Career Aspirations

Despite the global need for professionals in science, technology, engineering, and mathematics (STEM) related fields, there is a persistent decline in students' interest in STEM studies and careers. Various factors, both intrinsic and extrinsic, contribute to this decline, including socio-economic status, attitude towards science, and limited knowledge of STEM careers. To examine upper secondary school students' perceptions about careers on STEM related fields, and to understand factors influencing their career choices, we conducted semi-structured interviews for upper secondary students. Based on the preliminary findings, students described several factors that had influenced their career choices. These factors include self-efficacy beliefs, outcome expectations, interests and values, environmental influences, and contextual barriers. Furthermore, students described both negative and positive conceptions about science and STEM related fields. The findings of the study have important implications for both upper secondary school science instruction and career counselling. Students need more information and realistic conceptions about STEM related careers. These challenges can be addressed through informed instructional and counselling interventions.



Professor Joseph Krajcik directs the CREATE for STEM Institute at Michigan State University, where he is a University Distinguished Professor and the Lappan-Phillips Professor of Science Education. Throughout his career, he has focused on working with colleagues and science teachers to design and test project-based learning environments to reform science teaching practices to improve the teaching and learning of STEM. He served as president of the National Association for Research in Science Teaching (NARST), from which he received the Distinguished Contributions to Science Education through Research Award in 2010. In 2020, the National Academy of Education elected Professor Krajcik as a member, and he received the prestigious McGraw Prize for Innovation in Pre-K-12 Education. He has published over 100 peer-reviewed manuscripts and books on Project-based Learning and science education. In 2022, Professor Krajcik received an honorary doctoral degree from the University of Tartu in Estonia.

Building useable scientific knowledge across time

Developing scientific knowledge that individuals can use to solve challenging problems and explain complex phenomena requires students to have knowledge that they can apply. How do students develop such knowledge? In this session, Professor Krajcik will explore how critical scientific ideas, such as the transfer of energy, interactions between genes and the environment, and sustainability, develop only when learners tackle challenging questions over time. What can teachers do to support learners in developing such useable knowledge? Researchers have developed learning progressions that provide a means for thinking about how to support students in developing disciplinary knowledge so that their understanding builds within a year and across years to enhance their use of knowledge to solve challenging problems and make sense of complex phenomena.Learning progressions include instructional materials, assessment tasks, and key instructional components that can help students move from one level of understanding to more sophisticated levels of understanding. Such teaching provides challenges for teachers that require professional learning opportunities to support teachers in how to use learning progressions. Although challenging, building knowledge over time holds promise in supporting all learners in developing knowledge they can use for careers or for making decisions as citizens. University of Tartu, Committee of Education Estonian Academy of Sciences



Margus Pedaste is a Full Professor of Educational Technology at the Institute of Education of the Faculty of Social Sciences, University of Tartu. He also serves as the Vice Head of the field of development at the Institute of Education. Pedaste's teaching and research focus lies in improving learners' digital literacy, inquiry-skills, and problem-solving abilities. He specializes in educational technology's role in supporting teaching and learning, particularly in the context of science education. Prior to his academic career, Pedaste taught biology for 15 years and co-founded the Estonian Association of Biology Educators. He has led and participated as a principal investigator in numerous international research and development projects aimed at enhancing student learning and teacher professional development, as well as contributing to education reforms in Estonia. In recognition of his contribution, Margus Pedaste has been awarded the Order of the White Star by the President of the Republic of Estonia.

Meaningful use of technology to achieve science competence

International studies show that digital technology often has no on learning outcomes. We argue that the effect depends on how technology is used in the classroom and on the expected outcomes of the learning process. Therefore, we conducted the DigiEfekt project to investigate the uses and aims of digital learning materials in Estonian general education schools, as well as the characteristics of the learning process, students, teachers, classes and schools, and the interrelationships between those characteristics.

One focus of the project was on natural science studies in the 3rd, 6th, and 9th grades. In addition to classroom observations, interviews with teachers, and students' log data from E-Book Opiq, we used tests and questionnaires to understand how the characteristics of students, teachers, and the learning process affect science competence. Data were collected from students of 62 classes in 14 Estonian schools.

Hierarchical modelling was used to understand what variables have effect on science competence. The latter was operationalised through five types of knowledge and skills needed in inquiry process: analytical skills, interpretation skills, planning skills, subject knowledge, and inquiry knowledge. Intraclass correlation showed that significant amount of variance in student learning outcomes could be attributed to between classes differences – the least in the case of subject knowledge (7%) and the most in planning skills (33%). The results depended on profiles describing lessons, students' strategies in using E-Books, digital competence, frequency of using digital devices, students' personality and special educational needs, teachers' attitude towards technologies, digital readiness, self-efficacy, and agency.

In conclusion, the study confirmed that meaningful use of technology leads to positive effect on learning outcomes in different dimensions of science competence.



Dr. Jari Lavonen is a Professor of Physics and Chemistry Education at the University of Helsinki, Finland. He has been researching science and technology, specifically STEM, for the last 35 years. His areas of expertise include project-based learning, student interest and engagement, career awareness, transversal competences, and teacher education. His publications include 160 refereed scientific papers in journals and books, along with 140 other articles, and 160 books on education for science teachers and science education. Recently, he served as the Director of the National Teacher Education Forum and currently holds the position of Chair of the Finnish Matriculation Examination Board.

Educating experts in science education research through SciCar seminars

A continuous activity within the SciCar project has been the organization of joint PhD, or SciCar seminars. Before the seminar, students prepare a 4-page draft research article by reviewing an article from a student in another country. Subsequently, they prepare a seminar presentation based on feedback received on the draft article. During the seminar, the typical format involves a couple of plenary presentations and a presentation by the PhD student. Additionally, the students also serve as opponents. Following the seminar, the students continue to work on the manuscript with the aim of submitting it to a journal. The common aims and structures for the SciCar seminars were based on research within PhD education. The program was tailored to provide numerous opportunities for networking and informal learning alongside fellow students and supervisors. Special emphasis was placed on both formal and informal learning, as well as fostering opportunities for international collaboration and interaction. Participating students were invited to evaluate their learning experiences by responding to a questionnaire designed in accordance with research on formal and informal learning as part of formal PhD studies. In their responses, students emphasized that international formal and informal collaborations were the most beneficial aspects supporting their learning as PhD students.

Weizmann Institute of Science



Dr. Rachel Mamlok-Naaman, from the Department of Science Teaching at the Weizmann Institute of Science, has a background in chemistry and chemistry education. She has held various leadership roles, including serving as the head of the National Center for Chemistry Teachers, the chemistry group, and the chemistry teachers' Master program within the framework of the Rothschild-Weizmann partnership, as well as leading projects within the framework of the European Union. Additionally, Dr. Mamlok-Naaman is the Chair of EuCheMS DivCED, an Acs titular member, and serves on editorial and advisory boards of science education journals and organizations. Her publications focus on student learning and teachers' professional development. Dr Mamlok-Naaman has received several awards, including two from the Weizmann Institute - 1990-Bar-Ner Award for teaching, and the 2006 Maxine Singer Award for professional development of chemistry teachers, the ACS Award in 2018 for incorporation of sustainability into the chemistry curriculum, and the IUPAC Award for distinguished women in chemistry and chemistry engineering in 2020.

Job Shadows

The task of "Job Shadows during SciCar consisted of 2-3 days of observation of experts' work followed by discussions and interaction. This included: (1) Two researchers from the University of Tartu visiting a chemistry laboratory at the Weizmann Institute of Science, and participating in Single Molecules Protein Dynamics research, and (2) A visit by researchers from Estonia and Finland to the Dead Sea. One year later, they toured the Yatir Forest Ecophysiology group, where research on Biosphere-atmosphere interactions across scales and environmental conditions was conducted. The goal of this visit was to understand the processes underlying the response of ecosystems in dry climates to local and global changes, and how this interaction shapes the activities of the terrestrial biosphere. The evaluation of this task was conducted by asking the participants three questions: (I) How do the researchers in the lab you visited work as a team? (2) How did your research experience contribute to you as a science educator? (3) Did your research experience can be improved? The presentation will include their answers, as well as a description of their discussions with the research team leaders about the value of the research from an education perspective and for the society.

University of Tartu

Heili Kasuk has been a physical chemistry lecturer at the University of Tartu Institute of Chemistry since 2016 and Deputy Director of the field of study since 2017. Kasuk teaches various general and physical chemistry courses



for students in the medical, pharmaceutical, and genetic technology curricula. The topic and primary research focus of Heili Kasuk's doctoral thesis was the field of theoretical electrochemistry. During her doctoral studies, she worked as a visiting researcher at the Royal Swedish Institute of Technology, where she measured the diffusion constants of nanoparticles using electrochemical methods. After completing her doctoral studies, Kasuk was involved in the development of a polymer membrane electrolyte fuel cell catalyst in the PEM working group of the Institute of Chemistry. Since 2020, Heili Kasuk has been the Deputy Head of the Chair of Chemistry Didactics. The mission and purpose of the Department of Chemistry Education is to support central teaching and learning at all levels of chemistry education.

Building bridges

The activities of the SciCar project are seen as fostering collaboration among educational and research scientists and doctoral students through holding joint seminars and discussions and exchanging ideas on methodology and science teaching topics. In my case, the project aims to promote the integration of educational sciences, especially in the context of chemistry learning, into the attributes for effective chemistry teaching. Consequently, stimulated by SciCar, an interdisciplinary community of chemistry and chemistry education researchers, along with students, is being fostered seeking to enable a deeper understanding of the goals of the teaching process and research into approaches and application strategies of pedagogical methods, tailored to evidence-based teaching and learning needs.

University of Tartu



Rauno Neito holds both a bachelor's and master's degree in astrophysics and is currently a third-year PhD student in science education. Neito's research focuses on situational interest, examining how various factors such as individual interest, relevance and instructional activities predict the situational interest of students in physics learning. In addition, he is a part-time physics teacher at a lower secondary school and an avid folk dancer.

Situational interest and perceived relevance in physics learning modules

Interest, particularly situational interest engages students in learning. While the concept of situational interest and its influence on learning is not novel, understanding its evolution and strategies for maintaining it in different settings remains a challenge. This research contributes to filling these gaps in knowledge about interest. We focus on situational interest and perceived relevance of varying instructional activities used in physics lessons. Specifically, we are exploring to what extent can relevance and the way that instructional activities are implemented predict situational interest. The main data collection method used in this study is the experience sampling method or ESM. In short, the method involves gathering self-reports from participants multiple times per session.

How has SciCar supported PhD students: A personal reflection.

I started my PhD journey in educational science as a complete newcomer to the field. I didn't have any familiarity with the fundamental theories that are common knowledge to those who have studied to become teachers. Playing catch-up was tough, and my first year was challenging. I had to design and conduct a study on something I was still learning about as I went along. However, by the end of that year, I was invited to a SciCar summer school in Helsinki, which turned out to be a defining moment. The support I received from my fellow students and professors during those few days jumpstarted my PhD work. I'm happy to say that subsequent project meetings have always been helpful for me, propelling me towards completing my PhD studies. I strongly believe that such meetings are crucial for any student starting their studies – providing them with support and the reassurance that they're not alone.



University of Tartu

Professor Jack Holbrook has served as a visiting professor in science education for the past 25 years. He has been involved in overseas education projects in several Asian and European countries. His contributions include assisting in the development of a PhD

programme in science education and operationalizing the involvement of the University of Tartu in European development and research project such as PARSEL, PROFILES, Multico, Highfliers, SciCar and, latterly, acaSTEMy. His research focus has been on scientific literacy and competences, education through science, transversal skills, and transdisciplinarity. Professor Holbrook has supervised PhD students and published in numerous articles in academic journals and book chapters related to scientific literacy and transdisciplinarity.

Concluding remarks

The theme of the seminar follows up on an earlier SciCar seminar, focusing on novel aspects of research design and development for research instruments related to:

- 1. Educational Choices and Science Careers.
- 2. Science Career Awareness.
- 3. Building Usable Knowledge Over Time.
- 4. Meaningful Use of Technology.

Panel presentations will cover the following topics:

- Doctoral students' viewpoints on international collaboration, supervision, etc.
- Bridging the gap between scientists and sc. Educationalists from the viewpoint of a research staff member and supervisor.
- The role of job shadowing.
- Capacity building through career awareness and doctoral schools.

The seminar also seeks to reflect on how far the SciCar project played a positive role in:

- Decreasing the gap between research & education, fostering better synergies at UT institute level and internationally – leading to a decrease in networking gaps.
- 2. Enabling staff exchanges and expert researcher visits to promote knowledge transfer, including "job shadowing", in-service/teacher training courses, and research seminars.
- 3. Enabling international (joint) publications.
- 4. Creating new PhD positions, increasing PhD student mobility, enabling joint (summer) schools, promoting online training courses.

THE PROJECT "ADDRESSING ATTRACTIVENESS OF SCIENCE CAREER AWARENESS" (SciCar)

SciCar – a science education project – addresses the need to systematically raise the level of expertise among researchers and educators who are involved in science & technology (s&T) education within University of Tartu (UT) and associated institutions, currently seen as ineffective in making science teaching careers attractive and enabling teaching to adopt more relevant context-based approaches. The project especially addresses, via a Twinning partnership, bringing in expertise from top-level science education countries - Israel and Finland, particularly focusing on enhancing career awareness, enabling a capable workforce, and on promoting science-related careers. The major outcome is envisaged as a centre of excellence at UT in science education, interacting with all STEM teacher education bodies and the science education community e.g. science centres, science teacher associations. This is seen as enabling appropriate models for enacting a change of paradigm related to teacher education and science career awareness. A major focus is put on (I) reducing the gap between scientist and science educator beliefs in the training emphasis of future STEM-related teachers, (2) the involvement of the science education community in making the teaching profession more attractive, (3) thus determining keyways & appropriate models for instituting a paradigm change with a view increasing the number of STEM-related teachers, (4) and giving emphasis to competence development in promoting science-related career awareness. The created centre is to become a platform ensuring that science researchers are guided to embrace science education expertise, making the preparation for science-related teaching careers more attractive while applying excellent knowledge in research (and approaches to undertake research) in coaching the next generations of science education researchers. The project seeks to identify best practice on knowledge transfer between science development and science education.

Twinning partners are Weizmann Institute of Science (Israel) and University of Helsinki (Finland)

THE CONFERENCE VENUE

The residence of the Estonian Academy of Sciences (built during 1865–1868), on the slope of Toompea, is the former city residence of the prominent Ungern-Sternberg noble family and a conspicuous building in Tallinn architecture. The palace on Toompea was commissioned by Count Ewald Alexander Andreas von Ungern-Sternberg, descendent of a highly influential Baltic-German noble family. The architect of the building is the renowned Berlin architect Martin Philipp Gropius.



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