NATURAL SCIENCE AND TECHNOLOGY EDUCATION: BalticSTE2025

Vincentas Lamanauskas
Vilnius University, Lithuania
E-mail: vincentas.lamanauskas@sa.vu.lt

Natural Science and Technology Education (NSTE) is very important in the modern world, and there is probably no doubt about that. Understandably, it was important before, however, each era creates different challenges. It is obvious that science and technology are rapidly changing everything, especially the world of work. For example, knowledge about STEM (Science, Technology, Engineering, Mathematics) fields should help the younger generation acquire promising professions related to artificial intelligence, robotics, bioengineering, and other innovative disciplines. In addition, natural science and technology education forms/develops analytical thinking, experimentation, and logical decision making. These skills are needed not only in science but also in everyday life and the business world. Today's STE education, like any other field of education, requires scientific research, the result analysis of which would help to understand the gaps in the teaching process organisation, and help to find new didactic instruments (Schneider & Oberländer, 2008). Research shows that technology integration is changing STE education. It is emphasised that technologies increase student engagement, improve learning outcomes, and develop the essential scientific research skills. The use of technologies allows for the application of interactive and collaborative teaching methods, provides more opportunities for practical learning, and personalised education (Tindan & Rahaman, 2024). On the other hand, technologies help to develop creativity, problem-solving skills, and sustainable development competencies, especially relevant for the 21st-century labour market (Puchongprawet & Chantraukrit, 2022). It is crucial to educate students on the basis of science, technology, engineering, and mathematics (STEM) education to develop 21st-century learning skills (Xu & Zhou, 2022). Understandably, education and workforce competencies are considered vital for the digitalisation of various economic sectors at both macro and micro levels (Uzule et al., 2024). Finally, recent challenges relate to natural science/digital literacy education (how to begin to develop science literacy skills) (Kordigel Aberšek, 2008), and AI application in the natural science and technology education process (Aberšek, 2023).

Although natural science and technology education has been reformed in Lithuania, however, the results are not encouraging. The current task for the entire educational community remains how to make science and technology subjects attractive to students, so that they seek to connect their future careers with science and technology. It is understandable that school alone is unable to solve this complex task. The situation is determined by the general political-economic and, of course, social situation of the country. However, properly organised natural science and technology education in a general education school can significantly change the situation. The school's duty is not to develop specialised science and technology subject teaching at school, but specifically general science and technology education, so that each student acquires science and

https://doi.org/10.33225/BalticSTE/2025.07

technology education that is adequate for the time (Lamanauskas, 2008; 2015a). It is also clear that the implementation of technology in schools requires investment in equipment and teacher training, but it brings clear benefits – improves student understanding and facilitates the conveyance of complex scientific concepts. Research results show that both teachers and students acknowledge the benefits of technologies, especially the use of digital tools explaining complex topics and increasing student motivation (Slotta, 2014).

Thus, BalticSTE (Baltic Symposium on Science and Technology Education) is an international, biennial scientific event, the aim of which is to promote a dialogue, research development, and innovation in the field of natural science and technology education. The first symposium took place in 2015 in Šiauliai, Lithuania, and since then has become a significant platform that brings together scientists, researchers, and the educational practice community from different countries for constructive discourse and cooperation (Lamanauskas, 2015b). Later, other symposia were successfully held, namely the second in 2017 (Lamanauskas, 2017) and two years later, the third (Lamanauskas, 2019). The fourth BalticSTE2021 symposium was held remotely due to the ongoing COVID-19 pandemic at that time. However, despite various challenges, the fourth symposium was successful (Lamanauskas, 2021). Of course, after the Covid-19 pandemic ended, the fifth BalticSTE2023 symposium took place as usual, in Šiauliai (Lamanauskas, 2023). The symposium was held in cooperation with Povilas Višinskis Šiauliai County Public Library, and Šiauliai Technology Training Centre. These were the two main partners of the symposium. The articles of all scientific symposia were published in collections that can be found in academic databases (ERIC, Google Scholar, ResearchGate, CEEOL, etc.). It is worth mentioning that a publication was prepared, which retrospectively reviews all five symposia that took place. The book entitled *BalticSTE Symposia Retrospective: Five Milestones in Science and Technology Education (2015–2023)* offers an in-depth look at the evolution of science and technology education through the lens of five international BalticSTE symposia held in Lithuania (Lamanauskas, 2025). Drawing from over two decades of national and international educational initiatives, the book captures the dynamic shifts in pedagogical practices, technological integration, and competency development in natural science and STEM fields. Topics covered include innovative teaching methodologies, the impact of emerging technologies such as AI and IoT, interdisciplinary approaches like STEAM, and education for sustainability and social responsibility. Serving as both a historical record and a resource for future educational strategies, this retrospective highlights the significance of international collaboration and research-driven practice in shaping contemporary education.

This, the sixth BalticSTE2025 symposium, once again demonstrates a consistent and growing interest in natural science and technology education, which is gaining even greater importance in the modern knowledge society. Science and digital literacy, technological competence, and interdisciplinary thinking are becoming essential skills that allow an individual to effectively navigate and act responsibly in a rapidly changing world. It is obvious that scientific research in the field of science and technology education is of particular importance. First of all, because the current and future world is facing complex challenges, such as climate change, sustainability crisis, healthcare, digitalisation, and the development of artificial intelligence. For people to be able to critically assess and solve such problems, a high level of scientific and technological

https://doi.org/10.33225/BalticSTE/2025.07

literacy is necessary. Research in this area helps to understand how education can form such competencies. The BalticSTE symposium provides a platform for international dialogue between scientists. By presenting research here, it is possible not only to share results but also to compare experiences between countries, to discover common trends or distinctive regional features. In addition, the symposium brings together researchers from various fields – natural sciences, technology, engineering, mathematics, and education, promoting an integrated approach to educational problems and solutions.

This collection of scientific articles covers a wide range of topics: from curriculum renewal and competency-based education to advanced methodologies, such as metacognitive strategies, application of artificial intelligence, or multimodal teaching methods. Attention is also paid to the aspects of inclusion, integration of sustainability themes, and the role of leadership in the context of educational change.

We hope that this collection will serve as a valuable resource not only for educational researchers but also for educational practitioners and policymakers seeking sound, evidence-based decisions and sustainable educational development. The BalticSTE symposium continues to be a significant space for constructive collaboration, reflection, and promotion of progress in the field of natural science and technology education.

References

Aberšek, B. (2023). Science and artificial life form (ALF). *Problems of Education in the 21st Century*, *9*(1), 4–8. https://doi.org/10.33225/pec/23.81.04

Kordigel Aberšek, M. (2008). Science literacy: How to teach? *Problems of Education in the 21st Century*, *9*(1), 9–16. http://oaji.net/articles/2014/457-1392297877.pdf

Lamanauskas, V. (2015a). Gamtamokslinis ir technologinis ugdymas: „Perkrovimo“ prasmė ir būtinumas [Natural science and technology education: „Resetting“ meaning and necessity]. *Gamtamokslinis ugdymas / Natural Science Education*, *12*(2), 60–64. https://doi.org/10.48127/gu-nse/15.12.60

Lamanauskas, V. (2017). Natural science and technology education: BalticSTE2017. In V. Lamanauskas (Ed.), *Science and technology education: Engaging the new generation. Proceedings of the 2nd International Baltic Symposium on Science and Technology Education (BalticSTE2017)* (pp. 9–10). Šiauliai: Scientia Socialis Press. https://doi.org/10.33225/BalticSTE/2017.09

Lamanauskas, V. (2019). 3rd international Baltic symposium on science and technology education “Science and technology education: Current challenges and possible solutions (BalticSTE2019)”: Symposium review. *Švietimas: politika, vadyba, kokybė / Education Policy, Management and Quality*, *11*(1), 42–48. https://doi.org/10.48127/spvk-epmq/19.11.42

Lamanauskas, V. (2023). 5th international Baltic symposium on science and technology education “Science and technology education: New Developments and innovations (Balticste2023)”: Symposium review. *Švietimas: politika, vadyba, kokybė = Education Policy, Management and Quality*, *15*(1), 61–71. https://doi.org/10.48127/spvk-epmq/23.15.61

Lamanauskas, V. (2025). *BalticSTE Symposia Retrospective: Five Milestones in Science and Technology Education (2015–2023)*. Scientia Socialis Press. http://doi.org/10.33225/BalticSTE_Symposia/2025

Lamanauskas, V. (2008). *Gamtamokslinis ugdymas mokykloje – neatsiejama bendrojo ugdymo dalis* [Science education at school - an inseparable part of general education]. In *Gamtamokslinis ugdymas bendrojo lavinimo mokykloje - 2008* [Science education in general education school - 2008]: *XIV nacionalinės mokslinės-praktinės konferencijos straipsnių rinkinys* [Proceedings of the 14th national scientific-practical conference] (pp. 5–8). Šiauliai. http://www.lamanauskas.puslapiai.lt/GU14.pratarme.08.engl.pdf

Lamanauskas, V. (2015b). Natural science and technology education: "Resetting" meaning. In V. Lamanauskas, V. Šlekienė, & L. Ragulienė (Eds.), *State-of-the-art and future perspectives: Proceedings of the 1st International Baltic Symposium on Science and Technology Education (BalticSTE2015)* (pp. 7–10). Scientia Socialis Press. https://doi.org/10.33225/BalticSTE/2015.07

Lamanauskas, V. (2021). 4th international Baltic symposium on science and technology education "Science and technology education: Developing a global perspective (Balticste2021)": Symposium review. *Švietimas: politika, vadyba, kokybė / Education Policy, Management and Quality*, *13*(1), 47–51. https://doi.org/10.48127/spvk-epmq/21.13.47

Puchongprawet, J., & Chantraukrit, P. (2022). Creative Problem-Solving and Creativity Product in STEM Education. *International Journal of Instruction*, 7(2), 135–142. https://doi.org/10.29333/aje.2022.7211a

Schneider, K. I., & Oberländer, F. (2008). *Scientific learning in primary school education – A model study on children's concepts of physical material.* Department of Education, University of Rostock, Germany.

Slotta, J. D. (2014). Technology for science education: Research. In R. Gunstone (Ed.), *Encyclopedia of science education* (pp. 1–6). Springer. https://doi.org/10.1007/978-94-007-6165-0_523-1

Tindan, T. N., & Rahaman, H. A. (2024). *The impact of technology on science education*. GRIN Verlag. https://www.grin.com/document/1446145

Xu, S.-R., & Zhou, S.-N. (2022). The effect of students' attitude towards science, technology, engineering, and mathematics on 21st century learning skills: A structural equation model. *Journal of Baltic Science Education*, *21*(4), 706–719. https://doi.org/10.33225/jbse/22.21.706

Uzule, K., Gobniece, Z., & Titko, J. (2024). Digital transformation of economies through technology, education and competences. *Problems of Education in the 21st Century*, *82*(5), 758–774. https://doi.org/10.33225/pec/24.82.758

Received: *April 28, 2025* Accepted: *May 28, 2025*

Cite as: Lamanauskas, V. (2025). Natural science and technology education: BalticSTE2025. In. V. Lamanauskas (Ed.), *Science and technology education: Expectations and Experiences. Proceedings of the 6th International Baltic Symposium on Science and Technology Education (BalticSTE2025)* (pp. 7–10). Scientia Socialis Press. https://doi.org/10.33225/BalticSTE/2025.07