

NATURAL SCIENCE AND TECHNOLOGY EDUCATION: BalticSTE2023

Vincentas Lamanuskas 

Vilnius University, Lithuania

E-mail: vincentas.lamanuskas@sa.vu.lt

Dear Readers,

Time passes very quickly. It seems that the first BalticSTE symposium took place quite recently. However, eight years have already passed since the first symposium. During this time, when there is a rapid change in all areas of life, a lot has undoubtedly changed. The issues that were discussed during the first symposium have changed significantly. As an example, we can mention the possibilities of (AI), in this case, in the field of education. For example, last year saw the launch of ChatGPT, a chatbot programme that responds to text messages. It is a large language model developed by OpenAI that is trained to analyse and generate text in various contexts. This is just one example showing a rapid change in science and technology. It is gratifying that great attention is paid to these issues and to scientific articles published in this publication.

Thus, natural science and technology education is undoubtedly a significant area of general education. Living in the 21st century, which is often referred to as the age of modern biology, chemistry, physics, etc., as well as the age of constantly improving technologies, it is impossible to act without sufficient education in this field. It is only difficult to answer the question, what kind of education is sufficient? Is it finite and fixed? In the 21st century (a quarter of which has practically passed), we clearly realise that the development of society is inseparable from the development of natural sciences and technologies. Innovations based on the latter improve the quality of life of each of us and at the same time of the entire society, change the usual forms of professional activity, and force us to reconsider the importance of natural science literacy in the education system. Natural science education is not only an activity object of formal scientific and study institutions (Lamanuskas, 2005). The fundamental thing we aim for, is to promote all age group students' cognitive, research, creative activities, and independence, to help them form their emotional, and value relationship with the surrounding world. From a practical point of view, the educational process is organised during various activities, in order to enable learners to act in the nearest natural environment both directly and indirectly, expanding knowledge about nature and its phenomena through experiential, practical activities.

Despite various initiatives, natural science and technology education remains a rather problematic area. It is worth mentioning that the lack of natural science specialists has recently been felt not only in Lithuania but also in the whole of Europe. It can be mentioned that, according to PISA research data, Lithuanian students' natural science and mathematical literacy lags behind the average of the countries of the Organisation



for Economic Cooperation and Development (OECD). If we were to talk about national PISA results, we would see that there are greater differences than in other countries between children living in cities and villages, in different social groups. This alone shows that the situation is not favourable. Also, another tendency is observed. Evaluating university/college enrolment data, it can be seen that the popularity of exact sciences, natural science, technology and engineering sciences (study programmes) is not growing in Lithuania, despite various campaigns and promotions encouraging to choose, namely, this profile of university studies. Very often such steps give negative results, e.g., factitiously confronting natural science and technology and social-humanitarian sciences and studies. In recent years, the so-called STEM movement has found an expression in Lithuania. 10 regional STEM centres have already been established and are operating in Lithuania (<https://steam.lt>). It can be said that this is how Lithuania reacted to the mentioned challenges and in this way seeks to strengthen natural science and technology education. But, is STEM a panacea for solving/responding to the mentioned and unmentioned challenges in this field? Probably not. Especially since there are not only different concepts of STEM (STEM, STEAM, STEMM, STREAM, etc.), but they are sometimes contradictory. So, what is the difference? What is the benefit of STEM programmes/courses etc? Finally, does it matter? Education is already “filled” with the most diverse acronyms. We even get the impression that we live in a world of slogans and mottos. In the abundance of various gigs, concepts, terms, and acronyms, we often lose sight of the essence. After all, in one way or another, the basis of all these models is integration (integrated access in terms of content, activities, process and other approaches) (Lamanauskas, 1997; 1998; 2002; 2007). Fashion trends should not be forgotten as well. Fashions in education often overtake what is rational and expedient. From this point of view, it is not uncommon to get the impression that STEM is just a fashionable thing. Basically, it is constantly repeated that science and technology education is an integral part of modern life (Adams et al., 2018), science and technology education is an educational priority and/or a strategic requisite for all countries (Gil-Pérez & Vilches, 2005), science and technology hold the key to the progress and development of any nation (Anaeto et al., 2016), etc. Finally, the dilemma whether natural science education for all or natural science education for only some is not resolved, i.e. selective (see Jidesjö et al., 2009). If we examined the scientific information, we would find many similar claims and interpretations. But does that change anything? Is the scientific and technological literacy of each of us, of the entire society, improving? If it gets better, how? Does it always provide/create only a positive result? If we looked at least 80 years back, we would find that after World War II there was an equally great concern for natural science and technology education. For example, Dodds and Lefler (1946) claimed that there was a huge demand for technically trained (literate) workers. This was followed by the rapid and extensive preparation and implementation of various training (study) programmes (including specialised ones) in the field of natural science and technological education. Through all this time, basically not much has changed. We also discuss the low interest of children and young people in natural sciences and technology, differences remain in terms of gender, etc. Finally, confronting potential barriers to science and technology understanding did not disappear anywhere. Thus, it is obvious that the question what the importance of studying science and technology is remains open. On the other hand, what was said does not negate the necessity of change. It is obvious that it is necessary to

renew natural science and technology education, taking into account the current level of the development of society and the requirements raised for a modern educated person. The other necessity is also important, this is linking natural science and technological education with the modern level of development of natural/technological sciences. The third necessity is a clear focus of science and technology education on the scientific view of the world, scientific methods and new meanings and values of science (value orientation of science and technology education). It is worthwhile to expect that the research papers presented for this symposium at least partially try to answer this question.

In 2015 the first international symposium BalticSTE2015 took place. In the symposium book, 34 articles were published (Lamanauskas et al. 2015). This is an open-access publication, which can be found at: https://www.academia.edu/13101334/state-of-the-art_and_future_perspectives. Also, one can find a short video about the first symposium at https://www.youtube.com/watch?v=1q2vUdS_oN0. Later, the symposium was held in 2017 (Lamanauskas, 2017), 2019 (Lamanauskas, 2019), and 2021 (Lamanauskas, 2021). The latter took place remotely because, in the conditions of the Covid19 pandemic, it was the only way for the symposium to take place. Collections of peer-reviewed articles from all symposia are published and freely available and indexed in various scientific information databases, such as Academic Research Index, ERIC, CEEOL, ScienceGate, etc. Information about the four already held BalticSTE symposia is also available on the YouTube channel (<https://www.youtube.com/playlist?list=PLoZNO1c3zi70pj7cj6f9g2fmFDavdft68>).

This collection of BalticSTE23 articles presents 21 research papers and two introductory articles. Their thematic spectrum is extremely wide – from didactic to theoretical works. Equally wide is geographical distribution. The published articles were submitted by researchers from Brazil, Italy, the USA, Latvia, Poland, Lithuania, South Korea, Romania, Serbia, Slovakia, Slovenia, Finland, and Taiwan. Thirdly, the articles present various research studies in terms of applied methodological approaches and obtained results. Therefore, I hope that the prepared collection of symposium articles is an interesting and versatile mosaic of natural science and technological education. The publication also has obvious practical applicability, i.e., can be useful and informative for the academic community, practising educators, managers of research and studies, students and all those interested in this field.

First of all, I want to express my sincere gratitude to all invited speakers Prof. Dr. Andris Broks (University of Latvia, Latvia), Assoc. Prof. Dr. Paolo Bussotti (University of Udine, Italy), MSc. Ilva Cinite (University of Latvia, Latvia), Prof. Dr. Ching-Ching Cheng (National Chiayi University, Taiwan), Prof. Dr. Gabriel Gorghiu (Valahia University Targoviste, Romania), Prof. Dr. Jari Lavonen (University of Helsinki, Finland), Assoc. Prof. Dr. Predrag Pale (University of Zagreb, Croatia), and Assoc. Prof. Dr. Tiia Ruutmann (Tallinn University of Technology, Estonia). The contributions of all keynote speakers are very significant. At the same time, I want to thank all scientific committee members for their great contribution preparing the symposium scientific programme and organizational committee members for their contribution organising this important scientific event.

References

- Adams, J., Avraamidou, L., Bayram Jacobs, D., Boujaoude, S. B., Bryan, L., Christodoulou, A., Couso, D., Danielsson, A. T., Dillon, J., Evagorou, M., Goedhart, M., Kang, N-H., Kaya, E., Kayumova, S., Larsson, J., Martin, S. N., Martinez-Chico, M., Marzàbal, A., Savelsbergh, E. R., ... & Zembal-Saul, C. (2018). *The role of science education in a changing world*. Lorentz Center Leiden.
- Anaeto, F. C., Asiabaka, C. C., Ani, A. O., Nnadi, F. N., Ugwoke, F. O., Asiabaka, I. P., Anaeto, C. A., & Ihekeronye, N. (2016). The roles of science and technology in national development. *Direct Research Journal of Social Science and Educational Studies (DRJSSES)*, 3(3), 38-43.
- Dodds, B. L., & Lefler, R. W. (1946). Influence of science and technology on education. *Review of Educational Research*, 16(1), 30-38. <https://doi.org/10.2307/1168816>
- Gil-Pérez, D., & Vilches A. (2005). Contribution of science and technological education to citizens' culture. *Canadian Journal of Science, Mathematics and Technology Education*, 5(2), 253-263. <http://dx.doi.org/10.1080/14926150509556657>
- Jidesjö, A., Oscarsson, M., Karlsson, K. G., & Strömdahl, H. (2009). Science for all or science for some: What Swedish students want to learn about in secondary science and technology and their opinions on science lessons. *Nordic Studies in Science Education*, 5(2), 213-229. <https://doi.org/10.5617/nordina.352>
- Lamanauskas V. (1997). Kai kurie filosofiniai, socialiniai, didaktiniai integruoto gamtamokslinio ugdymo aspektai [Certain philosophical, social and didactic aspects of integrated natural science education]. Kn.: *Gamtamokslinis ugdymas bendrojo ugdymo mokykloje* (III respublikinės mokslinės konferencijos straipsnių rinkinys) (pp. 32-44). Žalasis pasaulis.
- Lamanauskas V. (1998). *Integrated natural sciences teaching by applying didactic differentiation* (Summary of the Doctoral Dissertation Social Sciences, Education Sciences- 07S). Vilnius Pedagogical University.
- Lamanauskas V. (2002). Natural science education at basic school: Some didactic aspects. *Journal of Baltic Science Education*, 1(1), 25-35. <http://www.scientiasocialis.lt/jbse/?q=node/37>
- Lamanauskas V. (2005). Tarptautinių organizacijų vaidmuo gamtamoksliniame ugdyme: veiklos apžvalga [The role of international organisations in natural science education: The review of activity]. Kn.: *Gamtamokslinis ugdymas bendrojo lavinimo mokykloje XI* [Natural science education at a General school] (nacionalinės mokslinės praktinės konferencijos straipsnių rinkinys) (pp. 40-48). Šiauliai.
- Lamanauskas V. (2007). Modern science education as investment to the future. *Journal of Baltic Science Education*, 6(1), 4. <http://www.scientiasocialis.lt/jbse/?q=node/121>
- Lamanauskas V., Šlekienė V., & Ragulienė L. (Eds.) (2015). *State-of-the-art and future perspectives. Proceedings of the 1st International Baltic Symposium on Science and Technology Education (BalticSTE2015)*. Scientia Socialis Press. <https://www.ceeol.com/search/book-detail?id=940820>
- Lamanauskas V. (Ed.) (2017). *Science and technology education: Engaging the new generation. Proceedings of the 2nd International Baltic Symposium on Science and Technology Education (BalticSTE2017)*. Scientia Socialis Press. <https://www.ceeol.com/search/book-detail?id=941411>
- Lamanauskas, V. (Ed.) (2019). *Science and technology education: Current challenges and possible solutions. Proceedings of the 3rd International Baltic Symposium on Science and Technology Education (BalticSTE2019)*. Scientia Socialis Press. <https://www.ceeol.com/search/book-detail?id=942413>

Lamanauskas, V. (Ed.) (2021). *Science and technology education: Developing a global perspective. Proceedings of the 4th International Baltic Symposium on Science and Technology Education (BalticSTE2021)*. Scientia Socialis Press. <https://www.cceol.com/search/book-detail?id=981533>

Cite as: Lamanauskas, V. (2023). Natural science and technology education: BalticSTE2023. In V. Lamanauskas (Ed.), *Science and technology education: New developments and Innovations. Proceedings of the 5th International Baltic Symposium on Science and Technology Education (BalticSTE2023)* (pp. 8-12). Scientia Socialis Press. <https://doi.org/10.33225/BalticSTE/2023.08>