LUMAT
International Journal on Math, Science and Technology Education

Fostering creativity and curiosity through technological problem-solving

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Editorial

The selection of the topic of this special issue "Fostering creativity and curiosity through technological problem-solving" was inspired by John Dakers' editorial in the previous LUMAT technology education special issue. In his article Dakers (2024) suggests that technology education poses students with two kinds of problems: problems of embodied applied problem-solving and problems of virtual creative problem-solving. This led us to think about the role of creativity and curiosity in these different types of problem-solving processes and elicited a desire to know more about practices that could enhance them in technology education.

We received altogether twenty submissions of which five met the defined scope and discussed either creativity or curiosity or both in relation to technological problem solving. Just like in the case of the first LUMAT Technology Education special issue, the most common reason for the manuscripts to fall out of scope was that they discussed technology in education instead of technology education and therefore lacked the connection to technological problem solving done by the learners. Of the five submitted manuscripts that met the scope, two are now published in this special issue.

In relation to technology education contexts, researchers have pointed out how practical learning and utilizing problem-solving approaches in technology education lessons help students conceptualise knowledge and develop various intellectual processes (Gibson, 2019; Ritz & Fan, 2015). Furthermore, a variety of cognitive skills and higher-order thinking skills can be developed and nurtured through their application in practical contexts (Strimel, 2019; Williams, 2009). Thus, the domain of technology education provides an important proving ground for theories of cognition, because concepts in technology are often taught through laboratory-based and other hands-on methodologies (Hayes & Kraemer, 2017). Technological problem solving can refer to solving problems with technology as well as to solving technological problems. Both processes require technological literacy – "the ability to use, understand and make decisions about

LUMAT Vol 13 No 2 (2025), 0. https://doi.org/10.31129/LUMAT.13.2.3307
Received 5 May 2026 / Accepted 8 May 2026 / Published 8 May 2026
Published by the University of Helsinki, Finland and LUMA Centre Finland.

technology" – and engineering literacy – "the ability to solve problems and accomplish goals by applying engineering design process" (Sneider & Purzer, 2014).

However, problem-solving as a teaching method is a broad concept with many variations in its implementation. One approach is to think of learning as a creative and collaborative work process (Kilbrink, Bjurulf, Blomberg, Heidkamp & Hollsten, 2014; Lavonen, Autio & Meisalo, 2004) or as learning in a real-life context (Hill, 1998) or as a practical, authentic learning process (Bohemia & Davison, 2012). Curiosity, the desire to know, can relate to any type of knowledge: know-that, know-how and know-why. Technological problem-solving can elicit curiosity in myriad ways and directions. In general, curiosity is fuel for learning and wisely used technological problem-solving can motivate students to learn not only about the technologies at hand but also about the natural or social phenomena the problem relates to. Barlex and Steeg (2018) describe learning as a process whereby understanding is built upon already existing knowledge. They argue that this process is most powerful when the construction environment is rich and ample opportunities are provided to view the success of one's construction efforts. Also, creativity, is best fostered using open problems with sufficient freedom for students to define the problem and go about solving it.

In the first research article "*Primary school students' problem-solving strategies in creating artworks with GeoGebra: Integrating computational thinking skills into mathematics and visual arts lessons*" Wahid Yunianto, Daniel Jarvis, Zsolt Lavicza, Zetra Hainul Putra and Shereen El-Bedewy studied how to utilize technology to support students' problem-solving skills and creativity by developing a GeoGebra-based Math+CT (Computational Thinking) task infusing arts. Their findings revealed that the designed task had promoted students' different problem-solving strategies while working with technology. Additionally, students were able to enhance their creativity through the completion of the "half-baked task" set.

In the second article "*Fostering Students' Process and Product Creativity Through Chemistry-Based STEM-PjBL in Vocational Context"* Fapriyan Wijoyo Mulyopratikno and Antuni Wiyarsi examined the level of students' creativity (process and product) and description of student's product in STEM framework. Their study applied pre-experimental with one-shot case study design with teaching intervention, which was STEM integrated Project Based Learning (STEM-PjBL) model for six meetings. The data was collected by the Rubrics of students' creativity process and product design. This study implied that the hydrocarbon and petroleum compounds chemistry program based on STEM integrated with vocational context can be used to foster students' creativity in automotive vocational schools.

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