

Integration of a 3D Printer in STEM Education

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Abstract

The integration of STEM subjects into curricula can be approached in various ways. Teachers engage students through stimulating activities that enhance thinking skills across cognitive levels. Incorporating scientific experiences, collaborative processes, and advanced technologies increases motivation and provides meaningful context. Advanced experiments promote digital literacy, creative thinking, and independent learning, enabling students to progress at their own pace.

Our research focused on integrating a 3D printer into STEM education for master's degree college students training to become elementary school teachers. Using a mixed-methods approach, we examined their perceptions, experiences, and reflections over a year and a half. Students overwhelmingly reported positive experiences, expressing enjoyment in using 3D printers and perceiving the learning environment as effective in developing teaching abilities. They identified connections to STEM by recognizing essential knowledge areas for problem-solving and operational skills application.

After a year and a half of teaching, 78% of the students, now working in elementary schools, shared their perspectives on the practical integration of 3D printers in STEM classrooms. They highlighted the added value of understanding design principles, linking theory to practice, and deepening their comprehension of the engineering design process. Additionally, they acquired new skills, such as planning 3D models, engaging in trial-and-error processes, and understanding the mechanics of 3D printing. While respondents noted technical challenges, they also offered significant pedagogical recommendations, reflecting essential STEM characteristics in their integration of 3D printing experiences.

This study demonstrates that incorporating cutting-edge technologies can enhance STEM education by fostering creativity, practical application, and essential teaching skills.

Keywords: design-engineering, sciences, teachers'- perceptions, teachers'-training