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Employing rapid prototyping design technologies to support contextualized mathematics education.

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Summary: This article presents a research study on the utilization of rapid prototyping design technologies to support integration of contextualized mathematics education into music themed activities at an interdisciplinary summer camp. The “World Music & Math Camp” focused on music related activities that employed rapid prototyping design technologies – including 3D-printers and other digital fabrication technologies to support students in designing musical instruments, as well as chroma key compositing to support students in producing math themed music-videos – as a context for teaching upper elementary students math. Participants in this free program included elementary teachers and students, together learning how music-themed activities employing rapid prototyping design technologies can help students understand the real-world problem solving powers of math. Results from the quantitative assessment of the intervention’s impacts showed small effect sizes upon the student participants for each of the four mathematics attitude constructs measured – confidence (Cohen’s $d = 0.21$), usefulness (Cohen’s $d = 0.20$), success (Cohen’s $d = 0.31$), and motivation (Cohen’s $d = 0.21$). Results from the qualitative data analysis were utilized to interpret the quantitative findings. The article concludes with implications for future research efforts on contextualized mathematics pedagogy employing rapid prototyping design technologies to support interdisciplinary learning environments.

Classification: M82 U72 F92

Keywords: teaching; real-life mathematics; educational media; research; innovation; rapid prototyping technologies; mathematical applications; music; interdisciplinary approach; learning; contextualized learning of mathematics; realistic mathematics education; embodied cognition theory; authentic learning theory; FUIRE model; SAMR model; primary education; lower secondary; student attitudes; preservice teacher education; experience reports

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