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New Macquarie University research shows makerspaces can be highly effective at developing primary school children's creativity, critical thinking, Design Thinking and digital skills

Makerspaces have been widely advocated as a way to develop STEM abilities and soft skills. However, until recently, there has been little research that investigates the learning and teaching outcomes possible with makerspaces, particularly for younger students.

Now a new Australian university research study on makerspaces in primary school settings reveals the compelling evidence of benefits of this type of learning for primary educators.

From August 2017 to July 2018, [Macquarie University's Department of Educational Studies](#) partnered with the NSW Department of Education, Carlingford West Public School, Parramatta East Public School, Oatlands Public School and Makers Empire for a research study on maker pedagogy and makerspaces in primary schools.

The research study examined how maker activities using 3D design and 3D printing technology could enhance learning and teaching outcomes: teachers from three schools undertook [Makers Empire's Learning by Design professional development course](#) and participating students used [Makers Empire's 3D modelling software](#).

The recently published research study report revealed that makerspaces can be highly effective at developing children's creativity, critical thinking, design thinking and digital skills. Students were highly engaged with the 3D technology, and the idea of solving genuine design challenges - it helped boost their confidence and resilience when dealing with setbacks, particularly for those less capable students.

In a different way, the research study showed that teachers became more comfortable with technology, and more collaborative and flexible in their teaching. All of the 24 classroom teachers who participated in the focus group expressed a desire to integrate 3D design-based makerspaces into their future classes.

Jon Soong, CEO of Makers Empire commented, "It's wonderful to have our work validated by this kind of rigorous academic research. Makers Empire works with thousands of educators teaching hundreds of thousands of students and it's vital for schools to know that our products are genuinely effective and engaging teaching tools."

The 282-page report of the study was authored by researchers from the [Department of Educational Studies at Macquarie University](#): Associate Professor Matt Bower, Dr Michael Stevenson, Professor Garry Falloon, Dr Anne Forbes and Dr Maria Hatzigianni.

Interested parties can [download the full report or the extract and executive summary](#) from Makers Empire's site. To learn more about the research, visit the [Primary Makers website](#).

Key Findings of the Macquarie University Research Study

Impact on Students and Learning

- “When undertaking makerspace-based activities, students were observed to develop **creativity, problem-solving skills, critical thinking, inquiry capabilities, design thinking skills**, collaborative skills, autonomy, **literacy, numeracy**, scientific understanding, technological capabilities, communication skills, reflective learning capabilities and **resilience**,” [page 12].
- “Maker activities using 3D technology resulted in **very high levels of student engagement**, as well as **increased levels of student confidence (particularly for less capable students)**,” [page 4].
- “Many of the students interviewed were **highly positive in their reviews of the Makers Empire 3D app**, with verbal ratings offered such as **“100%” or “11 out of ten”**. Eight students (**23.5%**) **chose to voluntarily use the app at home for fun**, often with members of their family” There were 32 students (**94.1%**) **who wanted to use 3D design and printing once they left school**, for instance as a career (“build houses so like... maybe people living in the street can have houses for them to get and live in”) or for fun (“like a toy, because I [already] made a toy ball for my dog”),” [page 9-10].
- “There were also **repeated stories of student transformation**, for instance, where one of Kindergarten teacher Julia’s previously reluctant writers had later become “a shining star,”” [page 8].

Impact on Teachers and Teaching

- “**All of the 24 classroom teachers who participated in the focus group expressed a desire to integrate 3D design-based makerspaces into their future classes**,” [page 9]
- “Teachers indicated that the **well-structured, pedagogically grounded, hands-on and situated professional learning** enabled them to develop a better understanding of makerspaces, how to teach in them, the technical skills required, and 21st-century capabilities,” [page 4].
- “The professional learning also **significantly increased their confidence to teach in makerspaces**,” [page 4].
- “An **unanticipated outcome of the study was the extensive teacher transformation that took place**. Several teachers indicated that they had shifted to be **more collaborative, flexible, and comfortable with technology**. Many teachers entered **learning partnerships with students**, and as a result, **students came to see their teachers as models of lifelong learning**. Some teachers related how these changes had transcended beyond their makerspaces modules – for instance, in the form of more inquiry-based, problem-based, and collaborative units of work,” [page 9].
- “Several teachers also pointed out that they appreciated how the makerspaces project enabled them to **implement an integrated curriculum**,” [page 8].

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