

Connecting the dots: enhancing curriculum through STEAM integration



Introduction

There's a growing buzz around integrating STEAM (Science, Technology, Environmental Studies, the Arts, and Mathematics) into the curriculum for junior secondary school students. This future-focused approach aims to spark curiosity and innovation. To explore the potential of STEAM programmes, a dedicated group of teachers from two schools embarked on a short-term research intervention. Their findings could help to shape the future of education.

Rationale for developing STEAM Inquiries

Traditionally, secondary schools have not focused on curriculum integration, with teachers often specializing in specific subjects. However, there's a growing global interest in integrating STEAM into secondary education. This shift is driven by the need to enhance cross-curricular education. Developing a skilled, integrative workforce that can "connect the dots" between different disciplines is crucial to addressing the economic and creative challenges of the 21st century.

Research design

This study involved two schools over a six-week cross-curricular STEAM inquiry and set out to identify trends emerging from the data, which included audio recordings of teacher meetings and journals documenting the lessons. One of the schools was situated close to the coast and the other, a small rural school with strong ties to its community. Qualitative data were gathered through audio recordings and journals, which were transcribed and analysed to identify key themes and trends.

What was the research looking for?

There were three key ideas that were used to assemble detailed data from the audio recordings and teacher diaries. These included:

- Teachers' understanding of STEAM and curriculum integration.
- Selections of particular learner competencies documented in journals.
- Teachers' responses in recognising and explaining STEAM integration as a pedagogical model.

Teacher Interpretations

The study involved teachers and researchers in designing cross-curricular learning experiences for students. The initial task was to define what STEAM means in the context of curriculum areas. The teachers decided that STEAM is most usefully framed by its role in addressing real-life problems and proposing coherent solutions. The learning experiences were designed to develop skills that enabled students to navigate between the individual STEAM subjects.

As the STEAM inquiry proceeded, specific design phases were noted. The initial phase drew on real-life and current contexts, while the second phase prioritised STEAM competence over learning through subject specialisation. Teachers reflected on their lessons, noting the importance of providing opportunities for student reflection and dialogue about their prior knowledge on the inquiry context.

Developing STEAM Competencies

The theoretical framework for the study was based on a larger framework for integrated STEM education (See Kelly and Knowles, 2016). STEAM competencies identified a range of skills, knowledge, and attitudes such as encouraging students to think creatively and explore new ideas, fostering innovation through artistic expression and scientific inquiry. Working on the STEAM project often involved teamwork, where students collaborate, share ideas, and communicate effectively with their peers and teachers. The students also developed an understanding of how different subjects intersect and complement each other, allowing them to apply knowledge from various fields to real-world problems. These specific competencies helped to prepare the students to navigate and succeed in a rapidly changing world, equipping them with the skills needed for future careers and lifelong learning.

Topics

The topics were designed to transcend traditional subject boundaries, integrating real-world contexts and relevance. The inquiry focused on two main topics: New Zealand's recycling programme and sustainability, and safety measures during a tsunami. The teachers created an overarching topic with an open-ended framework, promoting student autonomy and encouraging personal inquiries.

Students investigated the recycling practices in their local community. They conducted surveys, visited a recycling centre, investigated micro-plastics, and created presentations on how recycling

impacts the environment. They also organised a sustainability expo where students created booths showcasing different aspects of sustainability, such as composting, renewable energy, and water conservation. In terms of the topic “keeping safe in a tsunami”, students learned about the science of tsunamis, they developed comprehensive emergency preparedness plans for their families and communities. This included creating evacuation routes, presenting dramatic skits of what to do in a tsunami, designing information posters, assembling emergency kits, and identifying safe zones.

Teachers' insights of STEAM

Feedback from the teachers suggested that their study provided an opportunity for them to discuss curriculum integration using STEAM. Teachers found that STEAM integration offered differentiation in terms of pedagogies, with shifts to their teaching roles, and working more collaboratively. They reported increased student engagement and the development of STEAM competencies. Teachers also noted that students who actively engaged with the inquiry process found the activities more relevant to real-life issues.

Conclusion

Teaching the STEAM integration programme remained challenging for the teachers, involving new topics and pedagogies. Professional reflection was made available through weekly sessions, which teachers found valuable. The most positive feedback occurred where strong support from senior leadership provided necessary planning time and resourcing. Overall, the study highlighted the benefits of STEAM integration, including increased student engagement, collaboration, and the development of STEAM competencies.

Take away messages of STEAM integration

- STEAM integration helped the teachers from different curriculum areas to work more closely together, which is not often seen in secondary education settings.
- The topics used in the studies increased overall student engagement and developed STEAM competences.
- There was a sense of solution-oriented active learning going on.
- There was encouragement of science, media and technology careers.
- There was enhanced student collaboration.
- Opportunities for learners to take on social perspectives and voice their ideas.

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