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## Examining the Effect of an Integrated STEM Project on Year 7 Students' Critical Thinking & Attitudes to STEM

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Australia's future workforce will need to possess sophisticated STEM (science, technology, engineering and mathematics) skills and transdisciplinary skills such as critical thinking. The purpose of this study is to contribute to the development of critical thinking skills in Year 7 students by providing information and strategies for curriculum developers and teachers to engage and extend students with integrated STEM projects. Interdisciplinary curricula and teaching approaches are considered to be important to foster engagement, develop higher order thinking abilities, and to prepare children for 'twenty-first century skills'.

This research uses an interpretive case study mixed method design to examine the connections between teachers' implementation of an integrated STEM project and students' critical thinking abilities and attitudes to STEM. The research also examines the way a teacher embeds critical thinking skills into their teaching, by examining what teacher skills and resources are deployed to effectively implement interdisciplinary projects. Qualitative and quantitative data sources for this study include pre/post critical thinking dispositions and STEM attitudes surveys, teacher interviews, student focus groups, classroom observations, student work samples, and document analysis. A critical thinking disposition survey was used to provide a measure of students' critical thinking attitudes before and after the STEM project.

The Likert-scale instrument measures two critical thinking attitude domains 'critical openness' and 'reflective scepticism'. The STEM attitude survey measures four constructs: maths attitude; science attitude; engineering and technology attitude; and attitude to twenty-first century learning. This presentation will focus on data collected from a Western Australian secondary school implementing a Year 7 STEM program over two school terms. Students used the engineering design process and a device called a Makey Makey to build a solution to solve a real world problem of their choice.

Opportunities for critical thinking were identified throughout the STEM project: during the initial phases of inquiry when students are investigating and defining their problem; in the imagining phase when students are designing their solution; in the doing phase when students are producing their prototypes, and in the reflecting phase after they've evaluated their solution.

Teaching strategies such as coaching, modelling and scaffolding were used to embed and support critical thinking within STEM lessons however pre/post results for critical thinking dispositions and STEM attitudes were not significant.