Murwillumbah Public School

STEM Teacher Enrichment Academy North Coast Primary 2018

Wind Powered Cars for Years 3 and 4

Summary

Our Stage 2 STEM project, involved students and staff from Stage 2 along with 12 Year 2 students from a composite 2/3 class. Stage 2 designed the STEM project around our Science topic Smooth Moves, from the Primary Connections unit. Inspired by our initial Academy experience, it involved the design and production of wind powered cars. A hands-on parental STEM experience was provided for parents to fully understand their child's school STEM experiences. The objective was to address a fictitious issue with a local car sales business. Students were to design and create a model car meeting specific criteria.

Science and technology outcomes	ST2-9PWST, ST2-14BE, ST2-7MW-T, ST2-1WS-S, ST2-4WS, ST2-5WT, ST2-7PW, ST2-2DP-T, ST2-3DP-T, ST2-11DI-T, ST2-1VA, ST2- 2VA, ST2-3VA
Mathematics outcomes	MA2-1WM, MA2-2WM, MA2-3WM, MA2-18SP, MA2-9MG, MA2-10MG, MA2-11MG, MA2-12MG, MA2-14MG, MA2-15MG
English outcomes	EN2-2A, EN2-6B, EN2-7B,EN2-9B, EN2-12E
CAPA outcomes	VAS2.2, VAS2.3, VAS2.4

Statement of impact

The Wind Powered Cars project introduced students to collaborative, project based learning. The project successfully encouraged community engagement with colleagues, parents and students through information and practical sessions, presentations and showcasing. Implementing a teacher led STEM project initially, enabled the process, purpose and the outcomes of STEM to be clearly understood. Ultimately, identifying the value of student directed transdisciplinary STEM projects. Murwillumbah Public School is focusing on improving pedagogy through innovative, future focused teaching and learning practices integrating STEM with 21st Century Fluencies & ICT through an integrated curriculum.

For more information

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THE UNIVERSITY OF SYDNEY

Wind Powered Car - STEM Project — Stage 2 Term 2

Our STEM project, Wind Powered Cars is designed for Stage 2 along with 12 Year 2 students from a composite 2/3 class. Stage 2 teachers have designed the STEM project around our Science topic Smooth Moves, from the Primary Connections unit. Inspired by our initial Academy experience, it involves the design and production of wind powered cars. A hands-on parental STEM experience will be provided for parents to fully understand their child's school STEM experiences. The objective is to address a fictitious issue with a local car sales business. Students are asked to design and create a model car meeting specific criteria.

The Wind Powered Cars project introduces students to collaborative, project based learning. The project is designed to encourage community engagement with colleagues, parents and students through information and practical sessions, presentations and showcasing. Implementing a teacher led STEM project initially, will enable the process, purpose and the outcomes of STEM to be clearly understood. Murwillumbah Public School is focusing on improving pedagogy through innovative, future focused teaching and learning practices integrating STEM with 21st Century Fluencies & ICT through an integrated curriculum.

Purpose/context

Our STEM journey for Stage 2 at Murwillumbah coincides with a whole school STEM focus. Stage 2 has designed STEM projects around our Science topics. This project, inspired by our initial Academy experience, involved the design and production of wind powered boats and cars. A hands-on parental STEM experience will allow parents to fully understand their child's school STEM experiences.

STEM is an integral component of our School Plan. Under Strategic Direction 1- Purpose Future Focused Learners, the focus for teachers is to integrate STEM with 21st Century Fluencies and ICT through an integrated curriculum. Enhancing our experience and understanding of STEM, we have secured the use of a STEM Share Kit for Term 4, 2018. Each class will introduce a variety of technology to the students. A whole school showcase and exploration is to be held, providing students with the opportunity to experiment with a variety of technologies in a non-restrictive environment, with coding at the core. This will provide the opportunity for both students and teachers in pursuing a STEM rich future in education at Murwillumbah Primary School.

Outcomes

Working Scientifically, Working Technologically, Physical World

A Student can:

› investigates their questions and predictions by analysing collected data, suggesting explanations for their findings, and communicating and reflecting on the processes undertaken ST2-4WS
› applies a design process and uses a range of tools, equipment, materials and techniques to produce solutions that address specific design criteria ST2-5WT
› describes everyday interactions between objects that result from contact and non-contact forces ST2-7PW

Comprehensive List of syllabus outcomes being addressed

Science/Technology	Maths	English	Visual Arts
ST2-9PWST, ST2-14BE, ST2-7MW-T, ST2-1WS-S, ST2-4WS, ST2-5WT, ST2-7PW, ST2-2DP-T, ST2-3DP-T, ST2-11DI-T, ST2-1VA, ST2- 2VA, ST2-3VA	MA2-1WM, MA2-2WM, MA2-3WM, MA2-18SP, MA2-9MG, MA2-10MG, MA2-11MG, MA2-12MG, MA2-14MG, MA2-15MG	EN2-2A, EN2-6B, EN2-7B, EN2-9B, EN2-12E	VAS2.2, VAS2.3, VAS2.4

MATHS	LITERACY	SCIENCE	TECHNOLOGY	CAPA	ENGINEERING
*sketching/drawing 3D *time – stopwatch *measuring distance *collecting data *creating graphs Interpreting data/graphs Mass - weight	*communicating in a group *write Recount *Description *Explanation	*gravity – natural force *friction *wind/contact force *motion *force *movement *surface (effects)	*stopwatch *ruler *video *camera	*drawing *design *construction	*create *construction

Evidence of work for assessment purposes

Assessment Criteria, Observations, Work Samples

Marking Rubric: STEM Project Stage 2 Term 1 2018 *Wind Powered Car*

Students name_____ Date_____

	Limited	Basic	Sound	High	Outstanding	Score – 50
Demonstrates knowledge and understanding of The Learning Pit	No evidence	Pasted into Book	Pasted with evidence of understanding	Pasted with a high level of understanding	Pasted with an outstanding level of understanding	5
Design plan produced	No design plan	Basic design plan	Sound design plan	Highly detailed design plan	Outstanding design plan	10
Diagram is labelled	no labelling	1-2 items are labelled	3-4 items are labelled	5-6 items are labelled	All items are labelled	10
Materials Listed (used)	No materials listed	A few materials listed	Some materials listed	Most materials used are listed	All materials used are listed	5
Uses critical and creative thinking to create a model of a wind powered car	No model produced	Basic evidence	Sound evidence	High level	Outstanding level	5
Model successfully meets the 5 specific criteria	No criteria met	1-2 criteria met	3-5 criteria met	N/A	N/A	5
Works well in collaborative groups	No evidence of collaboration	Some evidence of collaboration	Sound level of collaboration	High level of collaborative skills demonstrated	Outstanding collaborative skills at all times	10

Project Details

DESIGN BRIEF

Hayes Toyota in Murwillumbah would like to develop and design a car that does not need petrol. The solution they believe is using Earth's natural forces to generate propulsion.

TASK

Design and create a car that does not run on petrol.

DESIGN CRITERIA

Your design must:

- Weigh between 50 and 300 grams
- Be powered by wind
- Travel at least 3 metres
- Carry 4 marbles

Stage 2 : STEM					
INTELLECTUAL QUALITY:		**QUALITY LEARNING ENVIRONMENT:**		**SIGNIFICANCE:**	
1.1 Deep knowledge	1.4 Higher order thinking	2.1 Explicit quality criteria	2.4 Social support	3.1 Background knowledge	3.4 Inclusivity
1.2 Deep understanding	1.5 Metalanguage	2.2 Engagement	2.5 Student self-regulation	3.2 Cultural knowledge	3.5 Connectedness
1.3 Problematic knowledge	1.6 Substantive communication	2.3 High expectations	2.6 Student direction	3.3 Knowledge integration	3.6 Narrative

Syllabus Outcomes/Content	Learning Activity	Resources
ST2-4WS investigates their questions and predictions by analysing collected data, suggesting explanations for their findings, and communicating and reflecting on the processes undertaken **ST2-5WT** applies a design process and uses a range of tools, equipment, materials and techniques to produce solutions that address specific design criteria **ST2-7PW** describes everyday interactions between objects that result from contact and non-contact forces **MA2-1WM** uses appropriate terminology to describe, and symbols to represent, mathematical ideas **MA2-2WM** selects and uses appropriate mental or written strategies, or technology, to solve problems **MA2-3WM** checks the accuracy of a statement and explains the reasoning used **MA2-18SP** selects appropriate methods to collect data, and constructs, compares, interprets and evaluates data displays, including tables, picture graphs and column graphs	**Classroom** • Revisit, discuss vocabulary of movement, force and motion • Introduce STEM, the meaning of STEM and what we are going to do with it • Look at the Learning Pit, the meaning of it and discuss the vocabulary • Discuss with students 'group work', how it feels and what it looks like when working in a collaborative group. List roles/responsibilities. • Introduce the task to the students/groups. Discuss as a class. • Invite an expert to talk to the students about the design process and things they may need to consider. • Discuss and show materials they will be given access to, to complete the task. • Explicit teaching of drawing designs • Explicit teaching of data analysis and representation • As a class revisit design brief and criteria. Discuss what Hayes Toyota would have to do to design and make a successful petrol-less car **Literacy Continuum** ⇒ Vocabulary knowledge – 8, 9, 10, 11 ⇒ Aspects of Speaking - 8, 9, 10, 11 ⇒ Reading Texts - 8, 9, 10 ⇒ Comprehension Cluster - 8, 9, 10 ⇒ Aspects of Writing - 8, 9, 10, 11	Smooth Moves unit (already taught) Learning pit poster and images (google) Scrapbooks Group work cooperative stencil Groups listed <u>Materials for Construction</u> paper clips, masking tape, pipe cleaners, paper, card, rubber bands, transparency film, balloons, straws, skewers, pop sticks, drinking cups,

ST2-4WS investigates their questions and predictions by analysing collected data, suggesting explanations for their findings, and communicating and reflecting on the processes undertaken **ST2-5WT** applies a design process and uses a range of tools, equipment, materials and techniques to produce solutions that address specific design criteria	**Autonomous Learning** • Students draw a model and label each part with materials used • Students decide in their group, which design they are going with and why • Students begin building their prototype, timeframe of 30 minutes • Testing Day: Each class tests their prototypes, one group at a time. Data is recorded – weight, distance, speed (time) • Students analyse data collected. They represent data for graph for weight, distance and speed • Students interpret data collected, record findings and draw conclusions • Students write an Explanation covering the details of their testing and the findings • Write a Recount showing what happened throughout the STEM projects process.	Grid Paper Scrapbooks <u>Materials for Construction</u> paper clips, masking tape, pipe cleaners, paper, card, rubber bands, transparency film, balloons, straws, skewers, pop sticks, drinking cups Constructions Ramp/Board Fans Stopwatch Measuring tape Paper/Texta Video Camera Literacy Books

Evaluation/Reflection:

Were students engaged in the project?
Were students able to work in collaborative groups?
Was the criteria set, met by students? Why, Why not.
How can we improve our projects in the future?
How do we work towards student led projects?

Adapted from Sturt Public School's program by Monique Williams