 STEM unit – Eden Public School

A chicken coop for Tarerergudje Outdoor Learning Space (Term 3)

Eden PS Stage 3 staff will create and implement a Project Based Learning (PBL) project using STEM pedagogy. Students will design and create an innovative chicken friendly outdoor learning environment. The wider community of Eden will provide skills, expertise and resources.

Unit overview

The purpose of our STEM project is to develop and implement an authentic learning experience to improve outcomes and well-being for not only disengaging students but all students in Stage 3. They will achieve Sci/Tech and Maths outcomes through project based learning in a real life situation. Through the plan and design process students will produce multiple drafts and learn the value of trial and error.

Big ideas

Students will understand that

* There are connections between decimal representations and the metric system.
* Accurate measurement is vital to drawing and construction
* Built environments are designed to meet the needs of people and animals.
* Relevant constraints must be considered in the design process
* Understand that criteria is necessary to evaluate and modify ideas.

Knowledge

* Students will know the appropriate unit and device to calculate area and perimeters.
* Students will know that whole-number dimensions of different rectangles can have the same area eg 2x6 will have the same area as 3x4
* Students will know some shapes have rigidity and are more suitable for construction.
* Students will know how to research, plan and design an outdoor learning area.
* Students will identify appropriate materials for the task of building a chicken coop.

Skills

* Students will be able to convert between common metric units of length
* Students will solve problems involving comparisons of lengths and areas using appropriate units
* Students communicate using appropriate language eg square centimetre
* Students successfully use measuring devices in real life situations
* Students will develop design criteria that considers, function, social and environmental considerations
* Students will develop a design brief in collaboration with others

Driving questions

* Why is it necessary to use a standard unit of measure?
* How do you determine the appropriate unit of measure?
* How can we best use the Tarerergudje Outdoor Learning area?
* What are the requirements of an effective and efficient chicken coop?
* What materials do we need?

Using the Quality Teaching Model

Know content and how to teach it

* Identify and clarify the key concept/s to be taught from syllabus subject content. (DK)
* Structure lessons to provide opportunities for students to communicate substantively about the key concepts, to engage in higher order thinking and show deep understanding of the key concepts of the lesson. (SC, HOT, DU)
* Have students make links between key concepts being investigated and contexts beyond the school. (C)

Know students and how they learn

* Design flexible learning tasks that will allow all students to experience success while demonstrating deep understanding of the content.(SS, DU)
* Connect learning to what is meaningful and interesting to particular students. (E)
* Design activities that require students to organise, apply, analyse, synthesise and evaluate knowledge. (HOT)
* Where appropriate, include members of the community from diverse cultural backgrounds as a resource in lessons. Incorporate practices and events of local communities. (CK)
* Provide learning activities and structures that foster substantive communication, eg. in pairs, small group discussion and cooperative learning activities to allow students to share substantive ideas. (SC)

Plan, assess and report

* Design tasks to address issues of direct relevance to students and their community. (BK)
* Select, develop and use resources that challenge students and require them to take conceptual risks. (HE)
* Scaffold tasks so that students can determine where they begin and what challenges they can meet. (SD)
* Devise assessment strategies that:
  + provide opportunities for students to evaluate, manipulate and transform information. (HOT)
  + provide multiple appropriate ways for students to demonstrate achievement of learning outcomes, eg. logbooks, presentations, performance, reflective journals, models and online products. (SD)
* Use a broad selection of student work samples that reflects the range of students in the class, to critically reflect on the associated assessment task or learning experience.

Communicate effectively with students

* Make explicit for students the key concepts, skills and processes they need to learn. (DK)
* Develop opportunities and structures for substantive communication, eg. in pairs, small group discussion and cooperative learning activities to allow students to share and develop substantive ideas about the learning. (SC)
* Reflect on and consider ways of including those students who are passively disengaged in the public work of the class. (I)
* Make explicit connections in ICT-based tasks between the ICT and the key concepts being explored. (KI)
* Design activities and resources that connect classroom knowledge with issues beyond the classroom in ways that create personal meaning and highlight the significance of the knowledge for students. (C)

Create and maintain safe and challenging learning environments

* Set learning activities that present a serious challenge to all students and encourage them to take conceptual risks. (HE)
* Acknowledge and celebrate success and progress in learning. (SS)
* Ensure that learning experiences are purposeful and interesting with clear goals that students perceive to be worthwhile. (SSR)
* Build success by appropriately structuring learning, eg. scaffolding for students needing support and providing open-ended tasks that enable a range of responses. (E)

Assessment overview

Performance tasks

* assessment task for perimeter and area
* log book
* completion of tasks, ie design plans and completed model

Other evidence

* observation
* Teacher, peer and self-assessment rubric
* iMovie
* completion of activities

Syllabus outcomes

Curriculum content referenced in this document is from:

* [Science (incorporating Science and Technology K-6) K-10 Syllabus](http://syllabus.nesa.nsw.edu.au/science/science-k10/) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2012
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| Syllabus outcomes/content | Teaching, learning and assessment | Resources |
| --- | --- | --- |
| MA3-9MG selects and uses the appropriate unit and device to measure lengths and distances, calculates perimeters, and converts between units of length.  MA3-10MG selects and uses the appropriate unit to calculate areas, including areas of squares, rectangles and triangles.  MA3-2WM selects and applies appropriate problem-solving strategies, including the use of digital technologies, in undertaking investigations  MA3-3WM gives a valid reason for supporting one possible solution over another | Mathematics  Numeracy Continuum – aspect 7  Level 5 – Iterates the unit  Level 6 – Structure of composite units of area | n/a |
| MA3-9MG, MA3-10MG, MA3-2WM,  MA3-3WM | In class   1. Revision and consolidation of aspects of accurate measurement of perimeter and formulae for measuring area. Discussion of appropriate unit for measuring the designated area. | worksheets |
| MA3-9MG, MA3-10MG, MA3-2WM,  MA3-3WM | In groups   1. Students measure perimeter of Tarerergudje Outdoor Learning Space. | trundle wheels, measuring tapes |
| MA3-9MG, MA3-10MG, MA3-2WM,  MA3-3WM | In class   1. Discussion of scale drawing – converting metres to centimetres as a scale. Practice drawing squares and rectangles on grid paper using a scale of 1:100. | grid paper, worksheets |
| MA3-9MG, MA3-10MG, MA3-2WM,  MA3-3WM | 1. Revise direction from Position strand and determine North, South, East, West of Tarerergudje outdoor Learning area. | compasses |
|  | In groups   1. Using measurements from Step 2 and appropriate scale, students draw a 2D plan of Learning Space on grid paper, then determine area. 2. Students draw rectangles with the same area but different dimensions. 3. Utilising data from Science and Technology, students design and map outdoor learning area, incorporating a chicken coop in 2D format on a scale of 1:100. | Assessment   * worksheet * plan on grid paper with calculated area and perimeter |
| ST3-5WT plans and implements a design process, selecting a range of tools, equipment, materials and techniques to produce solutions that address the design criteria and identified constraints  ST3-14BE describes systems in built environment and how social and environmental factors influence their design. | Science and Technology  In class   1. Discussion of prediction techniques and methods for gathering, measuring and recording data. | MyScience-EPS teachers |
| ST3-5WT  ST3-14BE | Whole stage   1. Visit from Design and Technology teacher, Eden Marine High School – Kate Mamone – Discuss design process and analyse design briefs with students, introduce new terminology. Introduce Log Book and Design Brief. | Kate Mamone – D&T Eden Marine High School |
| ST3-5WT, ST3-14BE | Design Brief – design a functional chicken coop for Eden Public School, to be placed in the outdoor learning space behind Tarerergudje.   * Explain objective of task, use of Log Book and assessment requirements. | log books |
| ST3-5WT, ST3-14BE | In groups   1. Students take photos of the space for future planning in step 7. They then observe, measure and record the movement of the sun in the designated outdoor area in hourly intervals by taking photos from same location. 2. Students analyse results, taking into consideration the position of sun in the sky during summer/winter months. These results will be considered during Step 7. | iPad or camera  iMovie |
| ST3-5WT, ST3-14BE | In class   1. Students research the requirements of a functional chicken coop – size, materials, access for chicken and humans, food storage, water receptacle, position in garden and the space required per chicken. 2. Students consider constraints and advantages of designated area such as direct sun distribution, shelter from wind and rain, flat and sloping areas, thermal radiation from brick walls, water run-off. 3. Students compile a list of criteria necessary to meet the design task of construction of a chicken coop. | computers/iPads  Log Book |
| ST3-5WT, ST3-14BE | In groups   1. Utilising skills and knowledge gained from Mathematics, Science and Technology, students design a ‘bird’s eye view’ 2D plan, on grid paper, of the outdoor learning area, with emphasis on the placement of their chicken coop. 2. Using isometric grid paper students draw a 3D design of their chicken coop. Plan must include all elements identified in the design criteria. 3. In technology lab, students use computers to transfer drawn design to Google Sketch Up. | photos, grid paper  log book  Simon Taylor – Technology teacher EPS  computers-google sketch up |
| ST3-5WT, ST3-14BE | In class   1. Class review, discuss and evaluate functionality of 3D designs. Do they fit the criteria? What elements of the designs do not work? What could be improved/modified? | building materials eg cardboard, paddle pop sticks, balsa, plastics, hot glue guns, tacks, split pins mesh fabric etc |
| ST3-5WT, ST3-14BE | In groups   1. Students modify plans. 2. Students construct 3D model of coop design. Students to gather suitable materials to build their design. | Not applicable |
| ST3-5WT, ST3-14BE | Whole stage   1. Display all completed designs with peer assessment of final product by using the established design criteria. 2. Select winning model and suggest improvements. | community members of Eden Men’s Shed, parents  Eden Mitre 10  Eden Waste and Recycling Depot |
| ST3-5WT, ST3-14BE | Collaboration with Community   1. With the expertise and “hands on” assistance of the community members of Eden Men’s Shed and parents we BUILD THE COOP! They assist in selection of materials and production, taking into consideration recycling and repurposing. Eden Mitre 10 and Eden Waste and Recycling Depot to be approached regarding donation/purchase of materials and pallets. 2. Utilise the Coordinator of our school garden, Nulliker Munda, to facilitate the production of outdoor furniture from pallets.   Stock the Coop!   1. Grand opening – Invite community to view final construction. Stage 3 students conduct all classes of Eden Public School on a tour of our Tarerergudje Outdoor Learning Space and introduce them to the chickens | Not applicable |

Evaluation

Evaluation strategies will include observation of engagement and on task behaviours, especially of disengaging students. Open ended questioning to develop higher order thinking will take place throughout the research and design process. Trial and error will be encouraged to assist the students in the realization that not all designs and ideas initially work.

Assessment tasks to monitor the retention of taught mathematical concepts will be given to students.

Peer and self-assessment and reflection will be encouraged throughout the project along with a summative conclusion. This will be presented as a written document to finalise their log book. The log book will be the major form of assessment as it will demonstrate their understanding of each step of the process. An iMovie will be produced as a visual representation of the project and be presented at the celebration.