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Design experiments

Design minds

Design and Technologies | Years 9-10

Visual Arts | Years 9-10 and Year 11-12

Cover: A brainstorming design collage. State Library of Queensland. Photograph by Becky Strong.

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Overview

This resource aims to foster a sense of curiosity, openness and play for students to experiment with materials and tools through the lens of designers and artists. Students will discover new ideas for making 3D structures and sculptures.

Students will explore techniques and processes used by designers and artists to apply design thinking to support investigations and predictions of our future needs for urban environments.

Curriculum links

Content descriptions — Years 9 and 10

This resource is aligned with Australian Curriculum[i], Design and Technologies, and Visual Arts, Years 9 and 10

ACTDEK046	Investigate and make judgements on how the characteristics and properties of materials, systems, components, tools and equipment can be combined to create designed solutions.
ACAVAM126	Manipulate materials, techniques, technologies and processes to develop and represent their own artistic intentions.
ACAVAM127	Develop and refine techniques and processes to represent ideas and subject matter.
ACAVAM128	Plan and design artworks that represent artistic intention.

Syllabus objectives — Years 11 and 12

This resource is aligned with the Queensland General Senior Syllabus v1.1 Visual Art, Year 11-12.

1	Implement ideas and representations
2	Apply literacy skills
3	Analyse and interpret visual language, expression and meaning in artworks and practices
6	Experiment in response to stimulus
7	Create meaning through the knowledge and understanding of materials, techniques, technologies and art practices

General capabilities

Learning objectives

Students are learning to:

- explore spaces in our communities in ways that engage audiences
- critically and creatively ideate possibilities for engaging audiences with interactive structures and sculptures
- use traditional and emerging technologies and materials to prototype interactive structures and sculptures for audience to engage with.

Success criteria

Students will be successful when they can:

- define target audiences who visit spaces in their local communities
- generate many ideas to engage a defined target audience using an interactive structure or sculpture for a space
- build a prototype for an interactive structure or sculpture for a space to engage a target audience.

Teaching notes

Timing

4 x 30–60 minute sessions

Materials

Sessions 1–4 (each student)

- ☐ Sketch book (e.g. visual diary)
- ☐ Pencils, pens and markers

Sessions 1–4 (each group)

- ☐ Stapler with staples, glue, scissors and pins (e.g. push pins, thumb tacks)
- ☐ Coloured sticky notes
- ☐ Adhesive putty (e.g. Blu Tack)
- ☐ Staplers, glue, scissors and pins (e.g. push pins, thumb tacks)
- ☐ Coloured sticky notes
- ☐ Butcher's paper, coloured card and recycled materials (e.g. boxes, paper plates, straws, paddle pop sticks)

Session 1 and 4 (each group)

- ☐ Plasticine
- ☐ 10m of 1–2mm thick wire
- ☐ 10m of 0.3–0.5mm thick wire
- ☐ 10m of twine
- ☐ $2m^2$ of Lycra
- ☐ 4 x pairs Nylon stockings
- ☐ 2 x A3 size thick cardboard to use as bases for the models
- ☐ 15 x 8mm thick dowel rods of varying lengths

Session 2 (each group)

- ☐ Makey Makey Kits[ii] and a laptop
- ☐ Alternative to using Makey Makey Kits is to make closed circuits
    - Small light bulb or a flashlight bulb
    - 2 x batteries with the correct voltage for your light bulb
    - 2 x alligator clip wires or aluminium foil
    - Paper clips
    - Electrical tape

Learning activities

Session 1: Experiment 1 — Optimised geometries

Introduction

- For this practical activity, encourage students to think about how they can explore materials through the lens of designers and artists to experiment with the process of making three-dimensional (3D) geometrical structures, architectural pavilions and sculpture installations.
- Lead a class discussion about geometrical and 3D forms, characteristics of materials and physical human interaction, supported with visual examples of 3D experimental pavilions and installations such as:
    - Green Ladder[iii], which was a gridded bamboo structure with a floating transparent ceiling which was on display at State Library of Queensland in 2016 as a part of the Asia Pacific Architecture Forum and the Sherman Contemporary Art Foundation's (SCAF) Fugitive Structures series.

Green Ladder Pavilion, Vo Trong Nghia Architects. Photograph by Diana Snape.

- Sulcus Loci[iv] is an immersive and interactive 3D installation designed and built by students from Interaction Design and Master of Architecture courses at The University of Queensland in collaboration with artist Svenja Kratz.

Sulcus Loci installation, University of Queensland Architecture and Svenja Kratz. Photograph by Diana Snape.

Making 3D structures

- Organise the class into groups of 3–4 students to work collaboratively to make 3D geometrical structures and sculptures using suggested materials and tools, which are detailed in the Materials section of this resource. For example, materials to make a base (e.g. card, dowel, wire, twine, pins, plasticine) and add cladding (e.g. Lycra, stockings).
- To influence their making, guide students to explore and exploit the characteristics of the materials to make geometrical forms that could be scaled up for humans to physically interact with. For example, geometrical forms include 3D prisms that are cubed, rectangular, triangular, circular, spherical, cylindrical, pentagonal, hexagonal, etc.
- Demonstrate a few simple making techniques and processes, such as folding, weaving, plaiting, slotting, hinging, bracketing, etc. Therefore, students are not yet aiming to fulfil a design brief to solve a problem.

Reflection

- How did you combine the use of materials and tools to make a 3D geometrical structure or sculpture?
    - What might happen if you replace a material you have used with another material?
    - How could that change of material use change the structure or sculpture?
- How could the structure or sculpture you have made be used to provide information?

- Analyse and explain what you have learnt about the characteristics of materials to make a 3D geometrical structure or sculpture.
- How does combining the use of materials and tools help to make a structure or sculpture?

Session 2: Experiment 2 — Introducing interaction

Introduction

To extend exploration of materials, this session introduces students to interactive technologies using closed circuits to explore possibilities for human interaction in spaces with 3D geometrical structures and sculptures. Students can use Makey Makey closed circuits or those they make themselves, depending on the resources available to the class working in groups of 3–4 students.

Interactive materials and technologies

Makey Makey is a small kit developed by Jay Silver of joyLabz that assists students studying art, engineering and design in understanding the basics of creating interactive information and communication technology (ICTs).

If Makey Makey kits are not available, students can make their own simple closed circuits using items detailed in the Materials section of this resource, such as light bulbs, batteries and paper clips.

Make a closed circuit

- Connect one end of each wire to the screws on the base of the light bulb holder. If you're using foil, screw enough to fit a foil strip under it.
- Connect the free end of one wire to the negative ("–") end of one battery. Does anything happen?
- Attach the free end of the other wire to the positive ("+") end of the battery. Now what happens?

Add power to the closed circuit

- Disconnect the battery from your circuit. Stand one battery so that the "+" end is pointing up, then set the other battery next to it so that the flat "–" end is pointing up. Tape around the middle of the batteries to hold them together.
- Set a paperclip across the batteries so that it connects the "+" end of one to the "–" end of the other. Tape the paperclip in place with a narrow piece of tape (do not tape over the metal battery ends).
- Turn the batteries over and tape one end of a paper clip onto each of the batteries. Now you can connect one wire to each paper clip. (The bottom of the battery pack should only have one paper clip — do not connect a wire to it.)
- Connect the free ends of the wires to the light bulb.

Reflection

- In what ways do we experience 3D geometrical structures and sculptures in spaces, other than sight (e.g. sound, light, touch, smell)?
- How might you incorporate opportunities for human interaction to design a structure or sculpture for a space?

- How might you design an structure or sculpture for a spaces that responds to human interaction
- In what way could there be human interaction using closed circuits? (e.g. action, reaction)
- How could the use of interactive technologies (e.g. closed circuits) to make structures and sculptures help people to interact with a space?

Session 3: Introducing the challenge — Immersive learning

Defining the inquiry question

- In this session, the design challenge is introduced.
    - To guide the design, an inquiry question may be defined by the teacher, or students may define their own.
    - To develop the inquiry question, students need to determine a design brief, with consideration for a specific space and the audience who will engage with an interactive structure or sculpture.
    - To select a space to design for all groups to use as stimulus, it is recommended the teacher guide students to explore spaces they can easily visit that are outside of the classroom, either at school or in the local community.
- The inquiry question needs to allow students to investigate how a structure or sculpture with interactivity may help an audience to ‘re-see’ and engage with a specific space. Example inquiry questions include:
    - How might we enable local people to ‘re-see’ a public space using an interactive structure or sculpture? e.g. local cultural precinct
    - How might we enable students to ‘re-see’ the a space on school grounds using an interactive structure or sculpture?
- Once the inquiry question has been defined, it’s time to investigate ideas about how and what the defined audience might ‘re-see’ in the space. Take students to the selected space to immerse themselves and engage their senses. Students need to use this immersive experience to make decisions about three key elements that will influence their design of a structure or sculpture:
    - placement in the space with consideration for perspectives and angles for viewing
    - opportunities for interactivity to engage peoples’ senses
    - further defining the audience to identify a target audience.

Fast paced ideation

The following activities are intended for students to complete within set times for a fast pace to generate as many ideas as possible and to make decisions quickly without dwelling too much.

Placement (10 minutes)

Take students to visit the space they selected for the class. Ask each group to consider possible locations within the space by walking around to make drawings, write notes and take photos. Groups then decide on a placement to immerse themselves in.

Audience (5 minutes)

Students are to rapid ideate more specific demographics to define a target audience. For example, if their audience is local people’, ask them to decide on a more specific target (e.g. children, families,

workers, etc.). Provide sticky notes and ask students to write one idea per sticky note. Try to get students to think of as many as they can in five minutes.

Students will then decide on a specific audience from their ideas who they will target to interest with their interactive structure or sculpture.

New site perspectives (15 minutes)

Students are to make observation of their space placement by considering it from a new scale perspective, working from micro to macro scale in three stages, for five minutes each. Ask each group to sketch, note and map the presence of each of the three scales for their placement. Encourage students to consider:

- micro — microscopic, small plants, materials
- meso — individual, neighbourhood, town, city, state, nation
- macro — globe, universe, cosmos.

Reflection

- This session should end with a quick reflection with each group looking to finalise notes on:
    - selected placement within space and target audience
    - insights that were discovered from the ideation activity
    - how they may include ideation insights in the design of the interactive structure or sculpture.
- By the end of this reflection session, students are to write three key highlights from the ideation activity to keep in mind for the next session and activities.

Session 4: Applying experiments — Implementation

Introduction

In this final session, students will work collaboratively in their groups to develop a prototype in response to their inquiry question and design brief in 2 phases.

Implementation Phase 1: Rapid prototyping

Students are challenged to combine their experimentations from Session 1 with the 3 insights from reflection in Session 2 to investigate and respond to the inquiry question.

The outcome of the prototype design is for students to decide within their groups, but it must be rapid prototyped in some way that combines the principles of optimised 3D geometrical structures and sculptures with interactivity.

Implementation Phase 2: Designing the pitch

Provide 15 minutes for each group to:

- name/title their prototype for an interactive structure or sculpture
- describe their prototype in 25 words or less
- illustrate their prototype in 3D to help others clearly understand (e.g. miniature model made of paper and cardboard)
- pitch their prototype to the class with a 2-minute presentation.

Reflection

- How does your structure or sculpture:
    - apply the concepts learned by the optimised geometries?
    - apply interaction design concepts?
    - change how the target audience might ‘re-see’ the space with the presence of your structure or sculpture?

References

[i] Australian Curriculum, Assessment and Reporting Authority (ACARA). Australian Curriculum, Visual Arts, 2019. Australian Curriculum, Assessment and Reporting Authority (ACARA), viewed 5 June 2021, https://www.australiancurriculum.edu.au/f-10-curriculum/the-arts/visual-arts/

[ii] Makey Makey. Invention kit for the 21st century, 2021. Viewed 7 May 2021, https://makeymakey.com/

[iii] ArchDaily. Green Ladder / VTN Architects, 26 Jul 2016. Photograph by Diana Snape. Viewed 7 May 2021, https://www.archdaily.com/792095/green-ladder-vo-trong-nghia-architects ISSN 0719-8884

[iv] Svenja Kratz. Sulcus Loci, 2016. Photograph by Diana Snape. Viewed 7 May 2021, http://www.svenjakratz.com/skprojects/sulcus-loci/

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