First Nations Australian Architecture

Year level: Years 3-6

This lesson plan is inspired by the content in the free CSER Maths in Schools Professional Learning Maths Online Course for Year 3-6 (See Practice and Pedagogies Module, Culturally Responsive Maths Pedagogy section) developed in consultation with ATSIMA. Enrol to find our more information at: https://www.mathematicshub.edu.au/MathsInSchoolsPL

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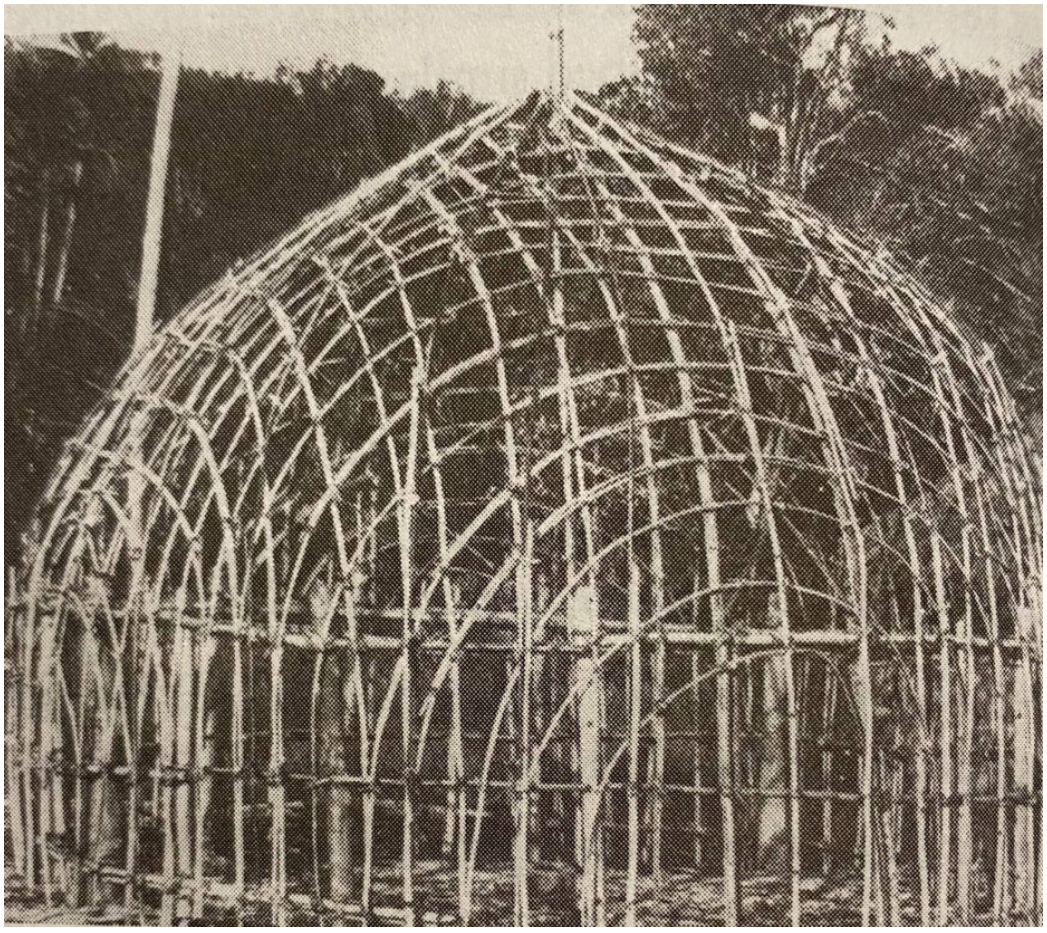
Image from Young Dark Emu *by Bruce Pascoe, 2019, p. 45.*



Summary

In this lesson, students explore First Nations Australian architecture – in particular dome dwellings - and put a 3D twist on it with their own architectural creation. They:

- investigate and explain how and why First Nations Australians' dwellings are oriented in the environment to accommodate climatic conditions
- explore the designs of dwellings of First Nations Australians, investigating the perimeter, area and purpose of the shapes within the designs
- investigate the design of First Nations Australians' dwellings, exploring the relationship between the cross-sections and the dwellings' construction.

Students work in groups to explore various forms of architecture both traditional and contemporary, and then design and plan their own which they create in the Gravity Sketch iPad application. Gravity Sketch is a 3D design tool that enables users to create and design in 3D.

Note to teachers

- The focus of this lesson is on traditional First Nations Australian architecture but consider ways that contemporary architecture can be influenced by it
- Use the notes at the bottom of the slides which provide cultural knowledge and questions for students.
- This lesson resource can be used and further developed for one or more lessons, for example, a double maths lesson
- To prepare for the lesson and gain a deeper understanding of the context and the mathematics involved, see Maths in Schools online course for:
  - teacher background information
  - lesson ideas

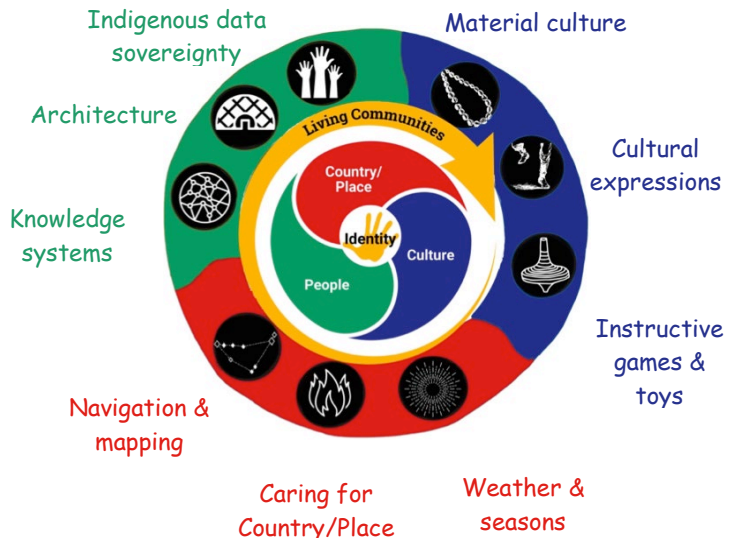
Australian Curriculum: Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority

This lesson is based on the Architecture rich context that connects to the key concept *People* in the Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority in the Australian Curriculum through ongoing organising idea:

A_TSIP3: The significant and contributions of First Nations Australians and their histories and are acknowledged locally, nationally and cultures globally.

It also connects with:

A_TSIC2: First Nations Australians' life reflect unique ways of being, thinking and doing. ways of knowing,



Australian Curriculum: Mathematics

Curriculum content that can be covered based on the context explored in this lesson, or extensions of this lesson, includes:

- make, compare and classify objects, identifying key features and explaining why these features make them suited to their uses AC9M3SP01

  ⇒ *investigating and explaining how First Nations Australians' dwellings are oriented in the environment to accommodate climatic conditions*

- solve practical problems involving the perimeter and area of regular and irregular shapes using appropriate metric units AC9M5M02

  ⇒ *exploring the designs of fishing nets and dwellings of First Nations Australians, investigating the perimeter, area and purpose of the shapes within the designs*

- compare the parallel cross-sections of objects and recognise their relationships to right prisms AC9M6SP01

  ⇒ *investigating the design of First Nations Australians' dwellings, exploring the relationship between the cross-sections and the dwellings' construction*

Connecting with Community

Learning opportunities can be further contextualised and deepened through a process of engagement with local Aboriginal and Torres Strait Islander Elders and Communities, and their knowledges and languages. **Acknowledging, consulting,** and **collaborating** with Community provides opportunities for two-way learning that is essential for creating, implementing and evaluating resources, teaching and learning strategies, and curriculum content. All students benefit.

Required Resources

1. Slide deck: First Nations' Australian architecture:
2. Range of materials such as pop sticks and plasticene/playdough for building geodesic structure
3. Student handout (see p. 11)
4. Video Gudtjitjimara: https://www.youtube.com/watch?v=hN0X9G2Z5U8 (also embedded in slide)
5. Book *Young Dark Emu* by Bruce Pascoe – chapter 4 'Home'
6. Coloured pencils and paper for sketching
7. IPad with Gravity Sketch downloaded (you can draw with your finger or use an iPad pencil if available) https://www.gravitysketch.com/ and Gravity Sketch YouTube channel: https://www.youtube.com/@GravitySketchYouTube

Suggested steps

The following three parts are suggested steps to deliver the lesson/s.

- **Part 1 - First Nations Australian architecture** involves an exploration of the rich context of Knowledge Systems through First Nations Australians' architecture
- **Part 2 – design and create** provides the opportunity for students to design and create their own interpretation and representation of architecture using 3D design tools.

Part 1 - First Nations Australians' architecture

Step	Slide	Activity
1.	**Slides 1-3**	Introduce to students the topic, acknowledge Country/Place, and Warning slide
2.	**Slide 4**	Open general discussion about *What is architecture*?
3.	**Slide 5**	Then show students definition and discuss different architectural features of their homes, school etc such as orientation of buildings, made for climatic conditions, shapes in building and size eg perimeter, purpose/use of buildings eg classrooms, how they are held together eg beams etc
4.	**Slide 6**	Draw students' attention to dome architecture and the image and discuss the features of the dome building eg the shapes used and how they fit together (geodesic) – spherical is shape with interlocking triangular pieces that make it strong, stable and material/energy efficient. (You could go into a science lesson here!)
5.	**Slide 7**	In small groups, students use range of materials to build their own dome structure in 5 minutes – use countdown on slide. When students have finished, discuss: • What shapes and objects are used? • What skills did you apply? • What maths is involved? • What are the common elements across the different structures built?
6.	**Slide 8**	Introduce students to the focus of the remainder of the lesson ie First Nations Australian architecture and that it in the maths curriculum and that through this context, they will be able to learn more about all of the above and some of the related maths situations that can be found in the maths curriculum noting that you're now going to focus on *geodesic design* in First Nations' Architecture.
7.	**Slide 9**	Discuss what students know about the different types of First Nations' dwellings/homes. Note that there is also a handout (see last page) to give to groups/individual students to complete during the learning process. This handout could also be used to assess student learning.
8.	**Slide 10**	Follow up with Slide 10 and what students would like to learn about First Nations' architecture.
9.	**Slide 11**	Look at and discuss the different types of architecture that was recorded by Walter Roth in 1897. Discuss what students can see and draw attention to the text underlined.

10.	**Slide 12 - 14**	Read the text on slides to students from the book by Bruce Pascoe, *Young Dark Emu*. If you have the book in the school, use that instead (pp. 44-47) • Note the words highlighted or circled in the slides that describe the architecture. Ask students to identify other words as well as you read the text
11.	**Slide 15**	Show the students how Aboriginal and Torres Strait Islander architecture has been used in more recent times to construct housing in a remote community in Western Australia. Note that this community has since been abandoned if students ask about it.
12.	**Slide 16**	Show the video (2:43 minutes, video also embedded in slide) letting students know that it is about Gunditjmara stone houses in Victoria. • Discuss with students what they noticed/learned, what was interesting • Again, draw their attention to the dome shape of the dwellings and the maths they can see
13.	**Slide 17**	Show students that dome dwellings were built all around Australia by Aboriginal and Torres Strait Islander peoples - • Note the different language to describe the different dome shaped dwellings • Note what the different dome structures are made of ie different available raw materials in the environment from the different regions around Australia (tree limbs, barks, grasses, foliage, vines, stones, soils)
14.	**Slide 18**	Show the students slide 18 which has examples from a series of lessons at Warakurna School in the Western Desert of WA • Discuss with students what they can observe ie materials being used, how they've been made, angles of the popsticks and why this is important (strength, stability etc), different shapes they can see…
15.	**Slide 19**	Discuss that Australian architecture is also taking cues from First Nations Australian architecture eg the design of the proposed new Aboriginal Art and Cultures Centre in Adelaide, SA. Discuss the shapes they can see and how they're fitted together etc.

The amount of time you allow for design and creation in the next session can be dependent on how much time you have in your lesson or classroom. We have put the minimum time we have used with a group of students but you could extend this to be 30 minutes design and 1hour create or undertaken as a series of lessons for students to research, design and create.

It is recommended that students are exposed to the Gravity Sketch environment prior to engaging in an activity brief so they understand the environment and the possibilities. Provide a short amount of time each for students to explore the tool.

Part 3 - design and create

19.	**Slide 20-21**	Let students know that they're now going to design their own dome structures using a Rapid design challenge in 10 minutes. Discuss: • they are going to design an architecture construction focusing on the use of geometric shapes and the role of angles such as they saw in the Warakurna School example • the design could be for a temporary or permanent dwelling, a place of employment, retail space, spiritual centre or any other building of choice. Tell students they need to think about: • the purpose of your dwelling • how many people will it house? • what does it look like? • what material/s is it made from? Start timer on slide.
20.	**Slide 22-24**	Introduce Gravity Sketch (or any other 3D design tool of choice). Move students into transferring their 2D designs into the 3D design tool.
21.	**Slide 25**	Students share their creations. Discuss: • What are the common structures, design elements across the different structures built? • How are they similar/different?
22.	**Slide 26**	Students complete the last section of the handout ie what they have learned about First Nations Australian architecture eg: • What did you learn? • What shapes and objects are used? • What skills did you apply? • What maths is involved?

Why is this relevant?

Learning mathematics through the context of First Nations Australian architecture supports students to:

- ⇒ Deepen their relationship with Country/Place and the natural environment
- ⇒ Explore First Nations Australians perspectives and develop understanding of First Nations' cultures
- ⇒ Value Aboriginal and Torres Strait Islander peoples' cultures and traditions
- ⇒ Consider sustainability
- ⇒ Understand how First Nations Australian architecture is informing contemporary architecture
- ⇒ Use cutting edge technology to interpret and represent First Nations Australian architecture.

Students learn about how 3D design tools and other new technologies are transforming and providing new opportunities for professionals. This lesson demonstrates cutting-edge practices in harnessing digital technologies for various design processes across creative industries.

In this activity, students are engaging core concepts of Computational Thinking and Design Thinking to break down their problem and plan an appropriate solution. Students are using design documents, project management, teamwork and planning in order to build their 3D creation.

Assessment

Use the table (see last page) and students' final creations to assess students' learning.

For this activity, students collaboratively prepare an oral presentation or video presentation and viewing of their completed VR artwork. In their presentation, ask students to address specifics such as their:

- Artwork title
- Artwork motivation/concept (including original artwork description)
- Description of 3D art materials used
- Process of 3D art techniques used
- Process of the technical design and development, including collaboration process
- Screen captures and/or a link to the final artwork in Gravity Sketch
- Any identified challenges and how they were resolved

Students can be provided with feedback from peers and the teacher. As well as a self-evaluation. Students should address, not only the art development but also the technical design and development.

For further advice, examples and support around assessment please visit the Digital Technologies Hub at digitaltechnologieshub.edu.au/teachers/assessment.

Curriculum links

Links across the Australian Curriculum

Year/band	Learning area	Strand	Content description
3-4	Visual Arts	Exploring and responding	explore where, why and how visual arts are created and/or presented across cultures, times, places and/or other contexts (AC9AVA4E01) • describing and categorising visual features and culture works around the school, such as artworks, craft works, design or architectural features, memorials, murals or displays according to their purpose; for example, social, decorative, architectural, functional, cultural
4	Science	Science understanding: Chemical sciences	examine the properties of natural and made materials including fibres, metals, glass and plastics and consider how these properties influence their use (AC9S4U04) • considering how First Nations Australians use materials for different purposes, such as tools, clothing and shelter, based on their properties
3-4	Design and Technologies	Processes and production skills: Investigating and defining	explore needs or opportunities for designing, and test materials, components, tools, equipment and processes needed to create designed solutions (AC9TDE4P01)
5-6	Design and Technologies	Knowledge and understanding: Technologies context: Materials and technologies specialisations	explain how characteristics and properties of materials, systems, components, tools and equipment affect their use when producing designed solutions (AC9TDE6K05)
3-6	Digital Technologies	Processes and Production Skills	use the core features of common digital tools to create, locate and communicate content, following agreed conventions (AC9TDI4P06)
5-6	Digital Technologies	Processes and Production Skills	select and use appropriate digital tools effectively to create, locate and communicate content, applying common conventions (AC9TDI4P07)

Further reading and resources for teachers

1. ACARA (2019). Australian Curriculum: Science Aboriginal and Torres Strait Islander Histories and Cultures cross-curriculum priority F-6, ACARA, pp.174-180. https://www.australiancurriculum.edu.au/media/5653/ccp-tbi-f-6-ver5-online.pdf
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3. Crook, L. (2021).Diller Scofidio + Renfro and Woods Bagot design Aboriginal Art and Cultures Centre for Adelaide, DeZeen: https://www.dezeen.com/2021/02/12/aboriginal-art-and-cultures-centre-diller-scofido-renfro-woods-bagot/
4. Dadson, M. (2020). "Building huts the old way to get Aboriginal culture 'strong' for future generations." from https://www.abc.net.au/news/2020-06-14/traditional-aboriginal-huts-being-rebuilt-along-tasmanian-coast/12353032.
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7. Grant, E., et al. (2018). The handbook of contemporary indigenous architecture, Springer.
8. Jones, D. S., et al. (2018). Indigenous knowledge in the built environment: a guide for tertiary educators, Department of Education and Training.
9. Lane, S. (2009). "Aboriginal stone structures in southwestern Victoria." Unpublished report prepared for Aboriginal Affairs Victoria by Quality Archaeological Consulting, Melbourne, https://www.vic.gov.au/system/user.../Stone-Structures-in-Southwestern-Victoria.pdf
10. Lund, C. (1978). "GEODESIC DOMES IN THE CLASSROOM." The Mathematics Teacher **71**(7): 578-581.
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13. Page, A. and P. Memmott (2021). First Knowledges Design: Building on Country, Thames & Hudson Australia.
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Handout: First Nations Australian Architecture

What I already know about First Nations Australian architecture?	What I want to learn about First Nations Australian architecture?	What have I learned about First Nations Australian architecture?