# Levels 9/10 Visual Arts Activity

## Inside Out – Public Art

## Introduction to Numeracy in Visual Arts

In the visual arts, students are engaged in making and responding, using “visual arts knowledge, understanding and skills to express meanings associated with personal views, intrinsic and extrinsic worlds” (Victorian Curriculum and Assessment Authority [VCAA], n.d.-a, para. 2). Students discover, experiment, and problem-solve through images and visual systems (visual perception, visual language, visual techniques, technologies, practices and processes) to explore and express the world (VCAA, n.d.-a). Traditionally, in Visual Arts learning, the focus is on embodied and experiential inquiry that combines spatial reasoning with “an understanding of how we can represent and communicate this knowledge through visual symbolic systems” (Grushka & Curtis, 2018, p. 423). The four strands of the Victorian Arts Curriculum (VCAA, n.d.-b) include content descriptors and elaborations for making and responding within Visual Arts learning. The four strands are:

* Explore and express ideas
* Visual Arts practices
* Present and perform
* Respond and interpret

When students make and respond in the visual arts, they explore and develop viewpoints, visual conventions, techniques and processes, materials, and information communication technologies. As makers and responders, students explore their roles as artists and viewers, and interact with artworks. Visual Arts students develop skills that are “transferable across learning contexts and support development of literacy and numeracy capabilities” (Australian Curriculum, Assessment and Reporting Authority [ACARA], n.d.). A range of numeracy skills relevant to students’ understandings in Visual Arts Levels 7 to 10 (as preparation for Levels 11 and 12 Visual Arts) include the following competencies:

* Appreciating artworks across time and cultures (e.g., understanding how proportion, ratio, and measurement are fundamental art principles)
* Working with spatial thinking and number (e.g., through shapes, scale, proportion, and ratio as applied to 2D, 3D, and 4D)
* Considering mathematical concepts alongside aesthetic aspects (e.g., beauty, style)
* Ability to calculate, estimate, measure, plan, and create artworks (e.g., use of measurement to determine shape, pattern, location, and transformation)
* Capacity to extend and develop patterns, repetition, and relationships (e.g., to design a pattern that is repeated in various ways; block, brick and half brick, drop, diamond)
* Working with scale, proportion, and ratio to establish comparative elements (e.g., the scale of sculpture to a specific site)
* Positioning, locating, and sequencing of art elements (e.g., making a time-based work, such as a stop-motion animation)
* Using technical skills to develop mathematical thinking (e.g., use of linear perspective in drawings)
* Problem-solving through visuospatial reasoning (e.g., understanding and recognising spatial relations among objects and space)

Students acquire knowledge and skills in numeracy throughout their life span. In the visual arts from Levels 7 to 10, students continue to apply and build on their numeracy skills. For example, students might use percentages to measure glaze, or use units of measurement or additive strategies to determine the area of a sculpture or to design a template. Students extend their knowledge about concepts such as positioning and locating or measuring time when designing, making, or responding to visual artworks (e.g., measuring transitions in a stop-motion animation, proportion and perspectives in a still life drawing). The sub-elements for the numeracy learning progression within Visual Arts are: number patterns, algebraic thinking, positioning and locating, understanding units of measurement, comparing units (ratios, rates, and proportion), interpreting fractions, understanding geometric properties,
and interpreting and representing data. For instance, students figure out how patterns
bring predictability when using number patterns and algebraic thinking. By incorporating mathematical concepts, students are able to address issues with making and responding
to artwork.

## Developing Numeracy Understanding in the Visual Arts

Numeracy encompasses knowledge, skills, behaviours, and dispositions (ACARA, n.d.).
In the visual arts, students engage with numeracy in multiple ways and situations. For instance, in undertaking observational drawing of faces, objects, and landscapes, and in creating patterns, murals, sculptures, and installations, students work with geometry as well as scale and proportion. Relevant numeracy knowledge and skills are required for students to “research, plan, design, and evaluate” (ACARA, n.d.) their ideas and artistic responses. Through art activities, students use spatial reasoning skills to estimate relationships (proportions) between items (e.g., comparing human scale to objects, architectural buildings, and monumental sculptures).

Grushka and Curtis (2018) state that “the application of numbers in visual art/design learning involves observing, analysing, measuring, counting and considering relationships between numbers, shapes, forms and rhythms in order to gain spatial harmony and balance when making design works” (p. 424). Hogan (2000) suggests three types of knowledge to be a numerate person and to function as a “fluent operator” (Callingham et al., 2015, p. 551). These three types of knowledge can be adapted in the visual arts learning:

* *Mathematical –* knowing enough of the mathematical underpinnings to make sense of a situation (e.g., students use mathematical underpinnings to make sense of measuring the length and breadth of calico to mount it on a frame)
* *Contextual –* recognising mathematics in a specific context (e.g., compositional aspects and measurement in drawing still life and human figures)
* *Strategic*–having the inclination to use mathematics or to learn the necessary mathematics to understand deeply a given situation (e.g., hanging artworks at eye level to estimate audience viewing experience)

As visual learners, students need the capacity to use mathematics with confidence (e.g., in designing murals, students calculate the area of a given wall, amount of paint required, percentage of one colour to another, and scale of imagery in relation to human scale). As artists and viewers, students critique mathematical approaches to given problems (Hogan, 2000; e.g., use of perspective, angles, and the golden ratio to create an illusion of space and depth on flat surfaces). For instance, Grushka and Curtis (2018) suggest that “in working with images and other visual systems such as three-dimensional models,” students need to “develop their cognitive tools and diagrammatic knowledge” (p. 423) to guide their thinking from design to finished products.

Hill (2000) posits that teachers, in general, have a known reluctance to engage with numeracy. Garvis and Pendergast (2010) agree that art teachers can feel challenged to become involved in exploring and applying numeracy to arts education experiences. There is a need for art teachers to build their capacity and confidence in understanding and applying the three forms of knowledge (mathematical, contextual, and strategic) that Hogan (2000) suggests. Teachers need to identify numeracy demands across the curriculum in order to provide students with more extensive opportunities to transfer mathematical knowledge and skills to real-life contexts (ACARA, n.d.).

Furthermore, Sellars (2018) proposed an integrated framework to reflect “on the personal nature of numeracy that is cultivated in the specific, particular social and cultural circumstances and situations” (p. 27). This framework is closely related to Visual Arts in terms of making and responding in expressing individual meanings and intentions within the broader context of societies and cultures. By recognising the interconnected nature of mathematical knowledge with other learning areas, teachers can encourage students to make further connections to mathematical skills (ACARA, n.d.).

## Lesson Plan: Inside Out – Public Art

Public art activates the imagination and encourages audiences to engage, reconsider, and perceive the environment in which they live more deeply. In this lesson, students explore public art as a topic of inquiry to stimulate their learning and thinking in, through, and about the visual arts. This lesson involves a cross-disciplinary approach to explore society and the interconnections between people’s lives and social spheres. Public art offers several ways to include numeracy skills within Visual Arts. Different aspects of numeracy are used across different visual arts forms in making public art (murals, sculptures, installation, computer-generated artworks, and photography). In studying artists’ use of mathematical processes, students develop an understanding of what is involved in design procedures. They explore how artists use scale and proportion, such as comparing size of sculpture, in relation to human scale. For instance, scale and proportion are design elements that are often considered simultaneously by artists and architects in various artworks (e.g., large and small sculptures either inside or outdoors).

* Scale refers to the comparative size of shapes or forms, use of time, and/or volume of sound in an artwork. Examples could be human, small, or large scale. Scale can be a comparison of sizes as in a ratio (e.g., one-half of the original). In relation to human figures, scale can be larger than, smaller than, or actual life size.
* Proportion refers to the comparative amounts or ratios of an element. This includes concepts such as the Golden Section and distortions. Proportion includes the connection between parts and the whole.

Many activities relating to public art can be explored through the four visual arts strands (VCAA, n.d.-b); however, the focus of this lesson is through these two strands: 1) Visual Art Practices and 3) Present and Perform. For this topic of inquiry, students will develop their creative thinking skills and imagination by using fluency, flexibility, originality, and elaboration (Torrance & Safter, 1999). In using fluency in their thinking, students will be able to generate and brainstorm ideas while exploring mathematical concepts around size (scale and proportion) and other art elements and principles in large scale public art (Heid, 2008). Students will have the flexibility to generate and synthesise different ideas and positions used by different artists who work on large-scale public art projects (as individuals or part of the community). Art teachers can encourage students to generate their own ideas, in applying and associating fluency and the idea of being “fluent operators” (Callingham et al., 2015, p. 551) to brainstorm and extend their independent ideas. In this lesson, students will require a more complex level of thinking than that required in using fluency only to understand and process creative shifts. For instance, students may explore photographic images that shift from production to large-scale representations.

By encouraging students to explore the concept of originality, they begin to explore multiple solutions through constructive imagination (Starko, 2005). For instance, they consider the adaptability of different materials, ideas, and art concepts in making large-scale works. As part of their own group or individual artwork, students will engage in an elaboration of ideas from their research of artists’ works (inspiration, experimentation) and apply them towards a more divergent thinking and making process (Starko, 2005). Students can work collaboratively in small groups. Teachers can choose a range of collaborative learning approaches, and other strategies for meaningful learning experiences (e.g., selection of groups, negotiation of roles and responsibilities, inviting groups for responses and questions).

## Prerequisite/Corequisite Knowledge: Visual Arts

* Ability to research and document online resources (e.g., virtual galleries, artists’ websites to explore images and artworks featuring large scale sculptures, murals, and installations)
* Ability to recognise relationships and visualise two- and three-dimensional shapes and structures
* Ability to use units of measurement and calculations to plan and design large scale artworks
* Ability to draft sketches and make visual models; use different art materials including cardboard, paper, wire, paint, and brushes; apply collage techniques
* Ability to use rulers, measuring tapes, and apps to enlarge sketches to large-scale works

## Background Mathematical Skills and Understandings

Visual Arts teachers are not expected to teach the mathematical knowledge and skills that students will draw on when engaging with this activity. The students will have learnt and should be adept with the required mathematical knowledge and skills to complete the activity. According to the Victorian Curriculum Mathematics, the required mathematical knowledge and skills should have been developed in earlier years of schooling, that is, by the end of Level 8.

For this activity, the background mathematical knowledge and skills needed to complete the activity are:

* Making length measurements using appropriate tools/instruments
* Converting units of measurement
* Using different units of measurements to compare (e.g., human size to artwork)
* Using scales in representations of the real world to upsize and to downsize dimensions (2D shapes and 3D objects) with and without technology – usually limited to regular geometric shapes and 3D objects
* Calculating areas of regular polygons (e.g., rectangles, triangles, parallelograms) and combinations of regular polygons
* Calculating volumes of 3D objects (e.g., spheres, cylinders, prisms, triangular/rectangular pyramids)
* Estimating and comparing areas by counting squares on grid paper

## Lesson Description

To begin the lesson, students will develop their familiarity in exploring various public art works to locate artists’ use of materials and techniques and their artistic intentions. The lesson begins with students exploring how public artworks impact viewers and why. Inspired by this investigation, students conceptualise and brainstorm ideas for planning, designing, and creating their artworks as inspired by different art concepts and artistic intentions. In a class discussion, students present, analyse, and evaluate displays of artworks in considering how ideas are conveyed to an audience.

### Tuning In: Public Art

The teacher asks students to explore public artworks online. Virtual access to global public art exhibitions offers students further scope to explore ideas, concepts, and themes examined by artists. Students are then guided to develop and understand the artists’ specific styles and intentions, which can inform their own ideas and techniques. Contemporary artists (such as Guan Wei, Ai Weiwei, Daniel Crooks, Anish Kapoor, and JR) can be explored for their use of scale and proportion in various art forms (sculptures, installations, photographic murals, etc.), as well as the aesthetics and other contemporary world issues represented in their artworks. Digital video and photographic works alongside media and technologies is an avenue for contemporary artists to capture and express their ideas and intentions. For example, teachers may want to examine the artists’ selection and manipulation of materials and techniques (e.g., the use of wire, cardboard, recycled materials). By exploring a range of such artworks, students are encouraged to engage in a more complex level of thinking to understand the process of creative shifts used by artists. In turn, students apply this understanding to express their own ideas, concepts, and themes. Teachers encourage students to conceptualise, plan, and design their own artworks while innovating ideas and concepts as inspired by these artworks. For example, for inspiration, students could develop individual artistic intentions around recently experienced events (e.g., COVID-19, confinement, and lockdown as expressed in proportion to the scale of the pandemic).

### Making Impact: Setting the Scene

In public artworks, artists aim to make an impact on the viewing audience. Students are encouraged to use their creative thinking skills and imagination (fluency and flexibility) to investigate artistic intentions of select public artworks. Students investigate scale (size of the artwork in relation to human proportion) and proportion (size of the parts of the artwork in relation to other parts of the same artwork) as design elements, as well as consider how these aspects affect viewers’ experience. In exploring different artworks such as installations, sculptures, and murals, students consider scale and proportion in relation to the spaces and locations in which these works are displayed. Students also examine how artists manipulate size for emphasis, distortion or manipulation of ideas, and intentions through their representation (e.g., JR’s work in using human scale in relation to architecture, Crook’s work in recording movement in relation to time).The students engage with large scale artworks:

* By undertaking field trips to visit local artists and installations, such as Melbourne street art, McClelland Park and Sculpture Gallery, and Peninsula Link Southern Way artworks (e.g., Frankie, the Chrome Gnome – See <https://rppfm.com.au/2020/02/frankie-returns-home-to-frankston-city/>).
* By viewing artworks by Daniel Crooks, students can see how scale and form become fluid movement through distortion and multiplication of digital imagery across time, sound, and place (e.g., Static No. 12; See: <https://blog.qagoma.qld.gov.au/daniel-crooks-in-conversation/>). Crooks “breaks” time down frame by frame to expand the viewer’s sense of time by manipulating digital “time slices” that are normally imperceptible to the human eye. In response, students learn how time scale can be manipulated by videotaping or photographing a given scene multiple times and then how, in post-production, splicing, extending and repeating segments can extend concepts of time and space.
* By viewing examples of Ai Wei Wei’s artworks where discarded life vests are wrapped around the German Konzerthaus to express the scale and plight of refugees (See <https://edition.cnn.com/style/article/ai-weiwei-berlin-life-jackets/index.html>). In covering this Berlin landmark with thousands of refugee life jackets, this striking display shows how the artist highlights the scale of migration taking place across the seas in contemporary times. In response, students work with objects and images employing the art principles of scale and proportion to help them represent an issue or concept through surprise or juxtaposition.
* By viewing JR’s photographic posters of installations in which he uses proportion and scale (e.g., his work on the Mexican side of the border between the United States and Mexico; see <https://www.jr-art.net/news/tecate>) shows Kikito, a 1-year-old boy, looking playfully over the infamous border wall. JR uses scale and proportion to create strong messages and meaning about border crossing. Another work by JR entitled Migrants, Picnic Across Border (See <https://www.jr-art.net/projects/migrants-picnic-across-the-border>) shows an event of a family gathering around a huge common picnic table spanning to both sides of the border. They share the same meal, water, and music. In response to these artworks, students discuss how artists use the monumental scale in relation to ordinary objects and imagery to change the intended meaning and relationship to everyday objects and people.

### Developing Imaginative and Original Artwork

Teachers help students to extend their investigation through originality and elaboration (Torrance & Safter, 1999). Teachers can choose to explore and extend these topics by working with students individually, or in small groups, in using different artworks and artists’ intentions (e.g., historical, political, and sociological aspects). Likewise, students can also investigate the use of materiality as an expressive form unto itself.

### Elaboration through Exploring and Extending Ideas used by Artists

Students are asked to formally analyse (using a student brief) one example of the proposed artworks. For instance, students could undertake a formal analysis of Guan Wei’s work entitled Feng Shui (See <https://www.mca.com.au/artists-works/exhibitions/830-guan-wei-mca-collection/>).

### Formal Analysis: A Student Brief

* Who is the artist? What is the subject matter? When was the artwork made and where was it exhibited?
* Where was it made? For what type of audience? Is the artwork typical to any other artwork from a geographical area?
* What are the different angles from which the artwork can be viewed? Do viewers need to look up at, or down at, it? As a viewer, do you see the artwork as the artist intended? Can it be seen on all sides/angles or just frontal or aerial view?
* Techniques, mediums, and materiality: What materials were used to make the artwork? How was it made? How would you define scale and proportion in the work?

### Description of the Artwork

Is this artwork representing an idea, topic, or theme? Briefly describe what is represented. What is the main focus, subject, or emphasis of the piece?

* What art elements and principles are dominant?
* Function and setting: How does the site-specific nature of these artworks play with size, scale, and proportion?
* How are the lines used? How do they contribute to size and proportion in the composition?
* Scale and proportion: How has the artist considered the human proportion of the viewer?
* Emphasis and subordination: How does the use of colour and shape imply size and perspective (e.g., receding colours, cool colours, tint and shades, decorative, values)?
* What devices has the artist used to show distance and scale (e.g., topographical marking, clouds in relation to floating figures)?
* Examination of space (implications to depth, overlapping of elements, and the use of perspective)
* Analyse and critique how time and motion are part of this work

### Creation of Artwork and Class Discussion

* Create artworks using chosen materials and techniques (scaffolding provided by the teacher in exploring different use of materials and techniques)
* As a classroom discussion, share how and why key elements and principles of art are used by a chosen artist to create meaning (also document and annotate these ideas in a visual journal)
* Discuss in class and also document in your visual journal, how the creation of your own artwork is inspired by the chosen artwork
* Consider the concepts of size, scale, and proportion in the history of art and how these have been employed by the artist to express concepts such as beauty, distortion, or exaggeration
* Discuss how your artwork employs the relative size of an object/image to another (scale) and/or how the size of objects/images are considered in relation to the whole (proportion)

Table 1: Links to the Victorian Curriculum – Visual Arts Levels 9/10

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| Strand and Sub-Strand (if applicable) | Content Description (Code) | Elaboration(s) |
| Present and Perform | Create, present, analyse and evaluate displays of artwork considering how ideas can be conveyed to an audience (VCAVAP044) | [Adapted Elaborations]Students visit online virtual galleries, art museums, and public art displays, in formal and informal settingsStudents explore a range of artworks in different settings and discuss how the location can influence the viewer’s understanding of the artwork (function and setting in public art)Students develop and express ideas as images, objects, and spaces, such as presenting artworks, and highlight how artworks demonstrate the interaction between the artist and the audience (scale and human proportion in public art)Students apply ethical understandings to a theme, concept, or subject matter when making their artworks |
| Visual Arts Practices | Select and manipulate materials, techniques, and technologies and processes in a range of art forms to express ideas, concepts, and themes (VCAVAV042) | [Adapted Elaborations]Students develop technical proficiency in designed and constructed artworks, using safe and sustainable practices (using mathematical concepts in creating their own large-scale artwork)Students use innovative thinking to explore the capabilities of digital technologies to resolve design and planning problems (enlargement of artworks using digital devices to work with size, scale, ad proportion)Students develop skills that can transfer to cross-media domains of Visual Arts and identify the translation of skills through mathematical concepts |
| Visual Arts Practices | Conceptualise, plan and design artworks that express ideas, concepts and artistic intentions (VCAVAV043) | [Adapted Elaborations]Students analyse and document the practices of selected visual artists (public art) to investigate their use of materials, technologies, techniques, and processes when developing their intentionsStudents develop an individual focus for a series of artworks based on a given theme, concept or subject matter (e.g., large-scale artworks indoors or outdoors)Students develop different options for making artworks in different forms and in using different art materials (using similar concepts used by artists, such as artworks made from different materials or produced in a different form to change the meaning of the artwork)Students apply their understanding of traditional art, craft, and design practices to plan the use of materials, technologies, and processes in a contemporary contextStudents plan, manipulate, and/or appropriate images, objects, and spaces into new contexts and meanings, applying a personal aesthetic (use of creative thinking skills, originality and elaboration of ideas and artistic conceptions) |

Table 2: Links to the 21st Century Numeracy Model (Goos et al., 2014)

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| Aspect of the Model |  How This Aspect is Addressed by the Lesson |
| Attention to Real-Life Contexts* Citizenship
* Work
* Personal and Social Life
 | Students consider size in real-life contexts (e.g., human scale in relation to architecture, recording of movement and events in relation to time) to understand how artists use scale and proportion to depict meaning and function (aesthetics, semiotics, etc.). |
| Application of Mathematical Knowledge* Problem Solving
* Estimation
* Concepts
* Skills
 | Students develop skills in understanding and applying size, scale, and proportion. They explore the use of ratios and percentages through viewing large-scale installations. Students learn to apply proportion and to interpret ratios (e.g., in using tools to enlarge designs through grid method, projector, and digital software). They explore the use of perspective and units of measurement through relative size, shape, and position of objects and images. Students use properties of shapes and objects, angles, and lines to position, locate, and visualise the orientation of public artwork. Students develop problem posing/solving methods and techniques in applying size, scale, and proportion. They also acquire knowledge of the mathematical skills that artists employ in public artworks. |
| Use of Tools* Physical
* Representational
* Digital
 | Students will compare and contrast tools for designing, for instance, a large-scale installation (measurement of surrounds in relation to artwork, use of a grid method and digital program to enlarge designs, etc.). Student will problem-solve the types of tools and techniques used for large-scale installations (e.g., logistics of space and installation; practical ways to build the artworks in different parts for accessibility, transport, and assemblage; measuring the amount of materials in terms of mass and density). Students will explore the volume of paint or the amount of plaster, cement, metal, wood, and/or clay needed to cover the surface of an artwork. Students will also consider the human scale of the maker (use of scaffolding, ladders, long-handled paintbrushes, and cranes). |
| Promotion of Positive Dispositions* Confidence
* Flexibility
* Initiative
* Risk
 | Students will develop the confidence and ability to plan, calculate, estimate, and measure scale, proportion, and size within public art (installations, murals, or sculptures). Students will exhibit preparedness to undertake trial and error design proofs in which they experiment with different aesthetic and mathematical concepts. |
| Critical Orientation* Interpreting Mathematical Results
* Making Evidence-Based Judgements
 | Students will develop an interpretive, evaluative, and analytical stance towards public art. They will form evidence-based opinions and apply their decisions through artmaking and responding. Using their critical orientation to numeracy, students will be able to create, respond, and interpret a range of relevant numeracy skills in an informed way. |

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